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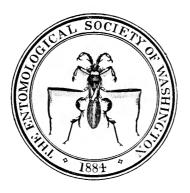
PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON



Volume XVIII

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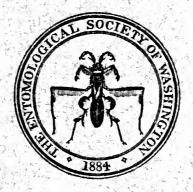
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THE

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The regular meetings of the Society are held on the first Thursday of each month, from October to June inclusive, at 8 P. M.

Annual dues of active members, \$3.00; of corresponding members \$2.00; initiation fee (for active members only), \$1.00.

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVIII 1916 No. 1

It is with great regret that the Entomological Society of Washington announces the death of three of its esteemed members, Harry Merwin Russell, Active Member, died June 26, 1915, Jean Henri Fabre, Honorary Member, died October 11, 1915 and Francis Marion Webster, Ex-President, died January 3, 1916.

The Society at the November meeting adopted the memorial in honor of Jean Henri Fabre which is printed in this number.

Resolutions in honor of H. M. Russell, adopted at the November meeting, with a biography and bibliography are published herein.

On January 14 the Society and members of the Bureau of Entomology held a meeting in commemoration of F. M. Webster. The resolutions adopted together with a biography to be prepared by Messrs. Howard, Marlatt and Walton will be printed in the next number.

Jean Benri Fabre

Jean Henri Fabre, Honorary Member of the Entomological Society of Washington, died at Orange, France, October 11, 1915 at the age of ninety-two years. He had held many positions of honor but will best be remembered by Entomologists as the ideal of that active devotion to nature now too rarely seen.

His entomological career began in 1855 and from then until his death he published many excellent articles on the habits of insects, principally in his Souvenirs entomologiques. The originality and fidelity to nature of his observations, as well as the delightful manner in which he presented them, attracted the attention of Entomologists long before their translation and popularization brought him fame and laid the foundation for the awakening of wide spread interest in the habits of insects. It is extremely fortunate for the entomological world that this keen and patient observer was given so many years to preserve in so charming a manner his records of insect habits.

Harry Merwin Russell

The death of Mr. Harry M. Russell at Tempe, Arizona is here recorded with sincere regret by the members of the Entomological Society of Washington. Mr. Russell has been an active member of the Society for the past eight years and regularly attended the meetings during his winter sojourns in Washington. Mr. Russell carried on much of the initial work of the truck crop insect investigations of the National Bureau in Florida and has added materially to the literature of our subtropical economic entomology.

His kindly nature and courtesy made him an esteemed friend of many of our American entomologists. This society wishes to record its appreciation of the loss incurred by the Society as well as by American Economic Entomology in his untimely death and to express to his family its sincere sympathy.

THE LIFE AND WORKS OF H. M. RUSSELL.

By A. L. Quaintance, J. A. Hyslop, and W. R. Walton.

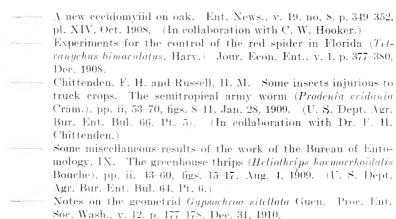
Harry Merwin Russell was born in Bridgeport, Connecticut, on March 30, 1882. He received his preparatory schooling in the Bridgeport public schools, graduating from the High School in 1901. He entered the Massachusetts Agricultural College in 1902 and received the Bachelor of Science degree in 1906. While a student he was employed during the summer months as a Deputy Nursery Inspector of the State of Massachusetts. The summer following his graduation, he was temporarily engaged in the Gipsey and Brown Tail Moth parasite work at the Saugus Laboratory, and that winter returned to his Alma Mater as a lecturer on Botany in the winter short courses. On May 1. 1907, he was appointed as Special Field Agent in the Federal Bureau of Entomology under Dr. F. H. Chittenden and was reappointed as Agent and Expert on July 1, 1908. On September 1, 1911 his title was changed to Entomological Assistant. The first three years of his work with the Federal Bureau were spent in investigations of the Truck Crop Insects in Florida. Here he met Mrs. Lillie S. Bryson, a daughter of the late Honorable David C. Slaughter of Memphis, Tennessee, to whom he was married on March 12, 1909 at Miami, Florida. He then went

to California where he carried on similar work until ill health made necessary his seeking a higher altitude.

On January 1, 1913 he was transferred to the Office of Cereal and Forage Insect Investigations and stationed at the Salt Lake City Laboratory in Utah. His health continued to fail and in a very few months he again moved, this time to Tempe, Arizona. His extensive experience with truck growing made him dissatisfied with field crop investigations and on September 16, 1913 he was transferred back to the Office of Truck Crop Insect Investigations. In October, 1914 he was forced by his continued failing health to request leave without pay, though he remained upon the rolls of the Bureau until the most prevalent disease of mankind finally claimed him. He died at Phoenix. Arizona on June 26, 1915 in the 33rd year of his life. His remains were temporarily interred at Phoenix and finally brought east and placed in the final resting place in Bridgeport on October 8, 1915.

He was a member of the American Association of Economic Entomologists, the American Entomological Society, and the Entomological Society of Washington. He joined the last named Society on December 10, 1908 and was an active member until his death. During the latter years of his life he gave particular attention to the Thysanoptera, upon which he published some very important papers, recording the first parasite ever reared from this order. Undoubtedly he would have taken rank with our foremost economic workers but for the unfortunate chain of circumstances which terminated in his death.

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Two Hundredth and Eighty-Ninth Meeting, November 4, 1915.

The rose aphis (Macrosiphum rosae L.) 15 p., figs. 4, pls. 3, May

Proc. Ent. Soc. Wash., v. 15, pp. 91-97, 1913.

19, 1914. (U. S. Dept. Agr. Bul. 90.)

The 289th meeting of the Society was entertained by Prof. A. L. Quaintance at the Saengerbund Hall, November 4, 1915. There were present Messrs, Baker, Böving, Pusck, Craighead, Crawford, DeGryse, Ely, Duckett, Fisher, Gahan, Greene, Hutchison, Knab, Kotinsky, Pierce, Popenoe, Quaintance, Rohwer, Sanford, Sasseer, Schwarz, Shannon, Turner, Walton, and White members and Max Kisliuk and H. L. Viercek visitors.

Mr. Robert J. Kewley was elected an active member and Mr. W. S. Blatchley a corresponding member.

At the close of the regular program, Mr. Viereck told of some of his experiences in the handling of parasites in the State of California and also gave some reminiscences of his visit to Italy. The following program was presented:

NOTES ON THE HABITS OF WEEVILS.

(Coleoptera, Rhyncophora.)

By W. DWIGHT PIERCE.

To the student of biologies the study of the weevils furnishes no end of surprises. We find almost every possible variation in insect life-history except those associated with parasitism. Among the weevils are external and internal plant feeders, predators on scale insects and on woodboring insects, cannibals, inquilines, and myrmecophilous species. They breed in every portion of plants and some of them form galls. We find the eggs laid singly and in cluster, exposed and concealed. Different species have very elever ways of preparing the food for the young such as making elaborate leaf rolls, scraping the surface of fruit to make a scaly covering, puncturing the midrib of a leaf to prevent sap flow and growing fungus upon which the young may feed. larvae are either external or internal feeders, phytophagous or entomophagous, sometimes even semiaquatic or aquatic. prepare silken cocoons. Some cover themselves with excrement. They mine leaves, tunnel stems, breed in buds, flowers, fruit or roots or eat the outer surface of plants. Some pupate in the plants, some on them, and many enter the ground. The development takes from a few days to several years.

In the course of the last few years the writer and his associates had occasion to work out the life histories of many species. While these will be written up in full in the future it may be sometime before they can be published and it seems advisable to publish at this time brief notes covering as much of this work as possible

so that other workers may have the advantage of them.

The genus *A pion* has been divided by European authors into a number of genera of which the characters correspond remarkably with the biology. A preliminary glimpse at the records of our American species indicates that we can coördinate our classification in the same manner. It will be first necessary to learn more about our species. The following records increase materially the knowledge of American Apioninae.

Apion impunctistriatum Smith breeds in the stems of the composites, Heterotheca subaxillaris and Ambrosia trifida in

Texas.

Apion ellipticum Smith forms a gall in the roots of Chaero-phyllum texanum, an umbelliferous plant. A 17 per cent control by parasitism was found at Dallas, Texas in 1907.

Anion falli Wagner (puriforme Smith) breeds in the pods of

Mimosa biuncinata, M. borealis, M. texana and M. fragrans and Acacia amentacea in Texas and Arizona.

Apion umboniferum Fall breeds in the berries of Viburnum

alnifolium in Texas.

Apion xanthoxyli Linell breeds in the seeds of Xanthoxylum pterota in South Texas.

Apion proclive LeConte breeds in the pods of Lupinus arborea

in California.

Apion rostrum Say breeds in the pods of Baptisia leucantha and B. tinctoria.

Apion varicorne Smith breeds in the flower heads of Parosela

aurea in Texas and Oklahoma.

Apion nasutum Fall breeds in the stems of a leguminous plant in Texas.

Apion subornatum Fall breeds in the pods of Acacia amentacea and A. roemeriana in Texas.

Apion decoloratum Fall breeds in the pods of Meibomia pani-

culata, M. grandiflora and Gnaphalium obtusifolium.

Apion solutum Fall breeds in the stems of Sphaeralcea angusti-

folia in South Texas.

joud in South Texas

Apion graciliforme Fall breeds in the stems of Kuhnistera oborata in Texas.

Apion aculeatum Fall breeds in the flower heads of huisache

(Vachellia farnesiana) and of a Mimosa.

Among these fourteen species of Apion are stem, root, flower, fruit and seed weevils. These will ultimately be placed in several very distinct genera. All species of Apion pupate in the larval cell.

Very little is yet known of the habits of our otiorhynchid weevils in this country. Notes on four species are presented

herewith.

Compsus auricephalus Say like many other otiorhynchid weevils related to it, lays its eggs in a mass of gummy substance on leaves and folds a portion of the leaf over them so that they are perfectly concealed. It has been found ovipositing in great numbers on cotton in south Texas. The eggs hatch in seven or eight days and the larvac enter the ground to feed on the roots of plants.

Achrastenus griseus Horn lays its eggs in clusters on fruit tree

leaves.

Aphrastus unicolor Horn lays its eggs in clusters on cotton and

other plants.

Pandeleteius cinereus Horn breeds in the stems of mistletoe (Phoradendron flavescens) in Texas. The adults mature in the spring. The entire development takes place in the larval cell.

Sitona flarescens Marsham breeds in the nodules on roots of

Lupinus pusillus at Dallas, Texas.

Lixus tenellus Casey breeds in the stems of an umbelliferous plant, causing a gall-like swelling. Like all other Lixus it pupates in the larval cell.

Lissorhoptus simplex the rice weevil also breeds on the roots of Echinochloa crusgalli in south Texas. The larva is an external as well as an internal root feeder and makes a pupal cell of mud.

Hyperodes echinatus Dietz breeds in the roots of Senecio lobatus and Plantago media in Texas and Louisiana. Hyperodes solutus Boheman breeds in the stems and scapes of Sagittaria latifolia at Dallas, Texas.

No records have ever been published of the supposedly rare genus *Pnigodes* but the writer has several species, one bred from *Ptilimnium capillaceum*, others bred from *Selenia aurea*, *Lepidium* and *Oenothera laciniata*. They are root weevils and very common in Texas.

Very little has been published on the habits of the genus Otidocephalus. It is therefore of interest to note that Otidocephalus arizonicus breeds in the stems of mistletoe (Phoradendron flavescens) at Dallas, Texas, and also in Arizona (as heretofore recorded). O. carinicollis Horn breeds commonly at Dallas in the twigs of Bumelia lanuginosa. The adults appear in April and begin to mate. The immature stages require at least until December for development. Hibernation occurs in the larval, pupal and adult stages. It was found parasitized by Eurytoma sp., Ptinobius sp. nov., and Heterospilus sp. O. chevrolati Horn breeds in the galls of Amphibolips on live oak twigs at Victoria. Texas. O. dugesi Champion breeds in cynipid galls on oak at Durango, Mexico.

Oopterinus perforatus Horn breeds in cynipid galls on roots of

oak according to Mr. Schwarz.

Orchestes pallicornis Say mines the leaves of Ulmus alata and U. americana at Dallas, and of Alnus at Falls Church, Va. Each larva makes a separate mine and pupates in a cocoon in an in-

flated portion of the mine.

Prionomerus calceatus Say mines the leaves of Liriodendron tulipifera, and Sassafras officinale around Washington, D. C., and in Florida mines the leaves of Magnolia. The eggs are laid in the midrib. Several larvae feed side by side making large mines which inflate when dry. The pupal cells are of silk and clustered together. It has been found parasitized at Clarksville, Tenn. This species was first recorded from Liriodendron by Townend Glover.

¹Rept. Dept. Agr. 1870, p. 68.

Tylopterus pallidus LeConte breeds in the berries of Forestierio acuminata at Victoria, Texas. It enters the ground for pupation. Tylopterus varius breeds in the berries of Adelia pubescens at Dallas.

Cylindrocopturus adspersus LeConte breeds in the stalks of Helianthus multiflorus, Ambrosia trifida and Xanthium in Texas. C. mammillatus breeds in the stems of Verbesina virginica in Texas and Oklahoma. C. operculatus Gyllenhal breeds in the stems of several species of Hymenopappus at Dallas. The species of this genus pupate in the larval cell. The larvae are usually found in the pith and are characterized by the dark spiracular areas.

Cryptorhynchus fallax LeConte breeds in the stems of Cassia

at Victoria.

Rhyssematus lineaticollis Say breeds in the pods of Asclepiodora viridis and Asclepias latifolia in Texas. The larvae enter the ground for pupation. R. pruinosus breeds in the pods of Mimosa fragans in South Texas. R. palmacollis Say breeds in the seed pods of Ipomoca sinuata at Victoria, Texas.

Chalcodermus vittatus Champion breeds in the seed of the balloon vine (Cardiospermum halicacabum) in south Texas. The larvae

enter the ground for pupation.

Tyloderma subpubescens Casey breeds in the stems of Poly-

gonum punctatum and P. portoricense at Victoria, Texas.

Conotrachelus similis Boheman breeds in the berries of Bumelia lanuginosa in south Texas. C. leucophacatus breeds in the stems of Euphorbia marginata. C. naso breeds in the acorns of Quercus virginiana. C. albicinetus was bred at Dallas from a gall on Cornus candidissimus. The larvae of Conotrachelus enter the

ground for pupation.

Conotrachelus elegans Boheman is a very important enemy of nuts. In Texas the first generation breeds in the petioles and new shoots of hickory (Hicoria alba). Later individuals are found commonly in the leaf galls of Phylloxera devastatrix on pecan (Hicoria pecan). Still later in the season, the species is bred from nuts of various species of Hicoria. C. posticatus Boheman and C. offinis Boheman both breed in hickory nuts in Louisiana.

Perigaster cretura breeds externally on the leaves and stems of Ludwigia natans in south Texas. The larvae are yellow and have a gliding motion. They spin a silken thread with which they form a covering while they eat. They work mainly under water. The pupal cell is composed of silk and a dark substance and is impervious to water. The adult is saltatory. This

genus is confined to the plant genus Ludwigia.

Barinus squamolineatus Casey breeds in the roots of a rush

(Rynchospora) in south Texas. B. albescens LeConte breeds in

the stems of Cyperus virens at Victoria.

Trichobaris compacta breeds in pods of Datura stramonium at Dallas. It pupates in the pods. The genus Trichobaris is confined to solanaceous plants but the species usually breed in the stems.

Rhinoncus pyrrhopus breeds in the stems of Polygonum pennsylvanicum.

Baris cuneipennis Casey breeds under the bark of the roots of Gaillardia pulchella, Helenium tenuifolium and H. microcephalum in Texas. Numerous species of this genus have been bred by the writer and all breed under the bark of the roots.

Orthoris cylindrifer Casey breeds in the stems and root crown of Mentzelia oligosperma at Dallas. The entire genus is confined to

plants of the genus Mentzelia.

Nyssonotus seriatus Casey breeds in the dry stems of Agave lecheguilla following attack by Peltophorus polymitus another weevil, in south Texas.

Rhodobaenus 13-punctatus breeds in the stems of Xanthium commune, Helianthus, Ambrosia trifida and Polymnia canadensis.

SOME INTERMEDIATES IN THE APHIDIDAE.

(Hemiptera.)

BY A. C. BAKER AND W. F. TURNER.

In a recent paper¹ the authors discussed the intermediates so far known to occur in the Aphididae and expressed the opinion that they are of normal occurrence in the family and indicate the method by which the apterous form has been derived. Intermediates of several other species can now be added to the list and it seems worth while to consider a few other points also.

If the family is at present in an unstable condition, and the alate forms are now being eliminated, two things would be expected, first, we would expect the primitive aphids to show a very high percentage of alate individuals and, secondly, we might expect to find alate examples of all the distinct forms of the family.

If a random collection of aphids were made today in America a very high percentage of the specimens collected would be apterous individuals and alate aphids would be few comparatively. It is interesting to note then that among the tertiary aphids so far as we know the American forms only one specimen is apterous. This might possibly indicate a preponderance of alate forms at the time these deposits were laid down.

¹ Proc. Ent. Soc. Wash., vol. xvii, 1915, p. 42.

Alate aphids of all forms have now been recorded. Alate sexual ovipara are rare, but alate males are of very common occurrence. In some species two forms of males are known to exist, alate and apterous. The males in certain other species are, in our opinion, clearly intermediate in nature between alate males and typically apterous males. The male of Toxoptera mullenbergiae Davis is apterous and yet it retains many characters of the typically alate male. The thorax possesses fairly distinct alate characters. This is of such a prominent nature that the insect suggests an alate with the wings removed. What is even more significant is the fact that the ocelli are present. These two characters show the undoubted intermediate character of this male. What has been said of mullenbergiae might also be said of the male of Aphis striplex Lin. This form likewise possesses remnants of the alate thorax and distinct occili, and is undoubtedly intermediate in nature. It is interesting to note that while in some males of atriplex the alate thoracic characters are well retained, in others they are represented by faint markings only. Both of these males might well be compared to the intermediate vivipara of *Phyllaphis fagi* Lin., herein described, excepting that the wings in that form are not entirely reduced.

The number of species with typically apterous sexed ovipara is very large. If the primitive aphids were sexed this condition would be expected much sooner than species with entirely

apterous viviparae.

Of the species of which intermediates are described in the present paper the writers have carried three throughout their entire eyeles. These three have annual cycles and alternate hosts. They are Macrosiphum viticola Thos., Aphis prunifoliae Fitch (the avenae Fab., of American authors) and Aphis malifoliae Fitch (the sorbi Kalt. of American authors). In the first two species the intermediates have occurred upon the summer hosts and were intermediates between summer apterae and summer alates. This is also true of the intermediates of another species, persicae Malifoliae Fitch winters upon the apple and spends the summer months upon species of Plantago, particularly upon rib grass. Alate forms during midsummer seem to be rare. The intermediates of this species occurred upon apple and were intermediates between alates which cannot live upon apple but must fly to plantains and apterae which cannot live upon plantains, but only upon apple. The intermediates lived and reproduced upon apple, thus taking on the nature of the primary apterous forms.

Following are descriptions of viviparous intermediates of seven species of aphids. One character is noticeable in all of these forms. The remnants of the wings hang drooping at the sides of the insects. They have lost the support of the muscles.

Aphis gossypii Glover.

Antennae of the same lengths as those of the apterous forms; the third segment, however, armed with usually six sensoria which are irregular in size, very few being large as are those of the alate; median ocellus absent, the lateral ones, however, present in the specimens obtainable for study; thorax with the alate characters very little, if at all developed, muscles much reduced and some embryos visible within the thorax; wings much reduced, being about as long as the third segment of the antennae; cornicles not as short as those of the alate form, nor yet as long as those of the apterous, slightly curved outward, but this character not as evident as in the apterous form; cauda and anal plate similar to those of the apterous female. Color and general appearance similar to those of the apterous form.

Described from three examples present in a collection taken August 9, 1912, on melon, Vienna, Va.

Phyllaphis fagi Linn.

Color nearly that of the alate. Antennae with the same measurements as those of the aptera, and with the same characters, there being no sensoria on the third segment; ocelli absent; alate thoracic characters distinct, showing moderately developed lobes on the dorsum; wings very much reduced, being small, oval, leaf like structures, with a thickening along the costal margin; other characters usual.

Described from one specimen in a collection taken on beech, May 12, 1914, at Washington, D. C.

This intermediate is interesting in having a fairly well developed thorax in connection with the much reduced wings. It is more interesting, however, in that this thorax, externally so well developed has lost the large alary muscles entirely. It is filled with developing embryos and, therefore, does not agree at all with the thorax of the alate form.

Macrosiphum viticola Thos.

Color similar to that of the apterous form; antennae with the same measurements as those of the alate and with the third segment possessing about six circular sensoria; vertex not extending forward to median ocellus, but almost flat, this median ocellus being very faint in one specimen and absent in the other; lateral ocelli present; alate thoracic characters hardly present. Wings showing as pad-like structures not as large as the wing pads of the pupa; wings of both specimens about equally developed, but the great dorso-ventral muscles of the thorax somewhat more reduced in one than in the other; cauda long and narrow, similar to that of the other adult forms.

Described from two examples, one in a collection of thirteen adults made May 30, 1905, at Laurel, Md., and the other in a collection of seven adults, made on June 2, 1907, at Washington, D. C., both upon grape.

Myzus persicae Sulz.

Color green, very similar to that of the apterous form; antennae with the same measurements as those of the alate, but without the row of prominent sensoria found on the third segment of that form (the right antenna of one individual has one sensorium); occili, absent as in the apterous female; wings reduced in one specimen to a little more than half the normal size with indications of some of the veins, in the other specimen small padlike structures; alate thoracic characters absent in the specimen with the smaller wings and but little indicated in the other; alary muscles much reduced in both specimens, in the one, at least, showing almost the exact condition met with in the aptera; cauda elongate like that of the alate form.

Described from two individuals taken on cabbage in the plant houses, Vienna, Va., February 5, 1915. One of these was isolated and produced young in the normal manner. Other intermediates of the species were observed, but were not obtained for description.

Aphis malifoliae Fitch.

General appearance, color, etc., resembling that of the apterous form. Alate thoracic characters absent; wing represented by small pad-like structure 0.32 mm. long in one specimen and 0.16 mm. long in the other. Antennae of about equal proportions in both specimens, though one is smaller than the other. Segment III, 0.576 mm.; IV, 0.352 mm.; V, 0.288 mm.; VI, base 0.112 mm.; unguis 0.576 mm. One specimen has six sensoria near distal extremity of III, fifteen on IV, and three on V. The other specimen has both antennae with the following sensoria, thirty-two and thirty-eight on segment III, seventeen and twenty-one on IV, three and four on V. Cornicles in one specimen 0.4 mm. long and in the other 0.448 mm.

Described from two specimens reared during the spring of 1914.

Aphis prunifoliae Fitch.

General appearance and color approaching that of the apterous form. Antennae of first specimen as follows: III, 0.24 mm. long, and armed with nine sensoria; IV, 0.112 mm. and armed with two sensoria. Segment V, base 0.064 mm. unguis, 0.336 mm. This segmentation of the antennae is characteristic of many of the summer apterous forms. Alate thoracic characters absent; wings represented by pads about 0.3 mm. long. In the second specimen are more typically alate being as follows: Segment III, 0.272 mm. long and armed with eleven sensoria; segment IV, 0.128

mm. long and with five sensoria; V, about 0.125 mm. long and VI base, 0.064 mm., unguis 0.352 mm.

Described from two specimens reared during the summer of 1915.

Eriosoma sp.

In a collection of an undescribed species of *Eriosoma* from pears in California made by W. M. Davidson, two intermediates are present. These resemble the apterous forms greatly but the eyes are composed of a large number of lenses. The apterous forms have a very simple eye composed of three facets whereas the eye of the alate form has many. In this intermediate nature indicated by the eyes only, the present species resembles certain species of *Phylloxera*.

In discussion, Mr. Rohwer stated that he believed the absence of wingless aphids in fossils could be explained by the method in which the geological formations were laid down. He did not believe that their apparent absence from fossils should be assumed to mean that they were not in existence at the time the deposits were formed.

THE EUROPEAN FIR TRUNK BARK LOUSE (CHERMES (DREY-FUSIA) PICEAE RATZ.) APPARENTLY LONG ESTABLISHED IN THE UNITED STATES.

BY JACOB KOTINSKY,

Forest Entomology, Bureau of Entomology.

Recently the Bureau of Entomology of the U. S. Department of Agriculture has received pieces of balsam fir bark rather heavily infested with a *Chermes*, which careful comparison with descriptions and figures has shown fairly conclusively to be identical with the above named European species. The specimens came from Mt. Monadnock, N. H. where, the correspondent states, the infestation has been spreading during the past three years and a considerable number of trees had died during the time. This identification, when brought to Dr. Hopkins' attention, reminded him of a *Chermes* he collected on bark of balsam firs in the vicinity of Brunswick, Me., in August, 1908. A slide preparation of this material showed it also to agree with *Chermes piceae*. The identification was based primarily on the integumental structure of the 1st instar of the stem mother in which form the insect hibernates on the bark and which presents the

most salient characters for the purpose. The absence of pores at the bases of the anterior and posterior coxae and the larger pores on some of the dorsal plates in this stage are some of the

characters specifically distinguishing it from others.

In Jour. Econ. Ent., III, 342–343, August, 1910, Dr. Felt reports the discovery of a Chermes on Nordmann's firs imported from Europe which was provisionally determined by himself and Dr. *Hopkins as Chermes piceae Ratz. The writer examined also this material, which consists of egg masses and old females on the bark of a terminal shoot, and the evidence tends to show that it is probably the young fir shoot bark louse (Chermes (Dreufusia)) nüsslini C.B.) which, biologically by Nusslin and later morphologically by Börner, has been found distinct from that living on

the trunk, the latter never going to the young growth.

The evidence, therefore, is at hand that the fir trunk bark louse has been in this country for at least seven years; and, judging by the location and the heaviness of the infestation of the bark collected by Dr. Hopkins, the insect must have been in this country a good many years, the exact or even approximate number of which we will perhaps never be able to trace. As regards Chermes nüsslini, Dr. Felt's note above referred to does not indicate whether any action has been taken to exterminate the colony on imported Nordmann's fir, so that we are not able to say whether or not that introduction led to its establishment in this country, if indeed, like Chermes piceae, it has not already been long established here.

In Europe both these species are practically confined to fir trees, and while they are presumed to have an alternate host, this host

is not known. Nor are even all the generations known.

In his "Coniferen-Laüse Chermes," published in 1907, Cholodkovsky records a Chermes that was sent him by Prof. Bouvier who collected it in one of the Paris parks on an American fir (Abies nobilis var. glauca) which Cholodkovsky designated as Chermes piceae, var. bourieri. The morphological reasons for separating the variety are slight, but the fact that it produced gall-like thickenings on the bark and buds was a rather marked biological difference. Nevertheless, in his article in the "Zool. Anzeiger," xxxIII, after describing nüsslini and discussing its relations, Börner remarks on p. 750: "As Cholodkovsky's var. bouvieri is identical with the true piceae (and not a hunger form of nüsslini, as I was wont to believe), we do not know whether the European piceae attacked the American silver fir after its introduction into Europe, or whether this species occurs also in North America and there completes its normal cycle, and must patiently await further discoveries on the geographical distribution of Chermes piceae.

In Europe piecae occurs on many species of fir. It hibernates on the bark as the stem mother larva which is elongate, black, with a double, elongate brush of wax along the medio-dorsum and a fringe of the same substance around the base. With the inauguration of spring it begins to grow and molt, the waxy down likewise growing more profuse. By April it reaches maturity and deposits about 140 light reddish brown eggs which hatch during May into either summer stem mother (aestivalis) or winter stem mother (hiemalis) larvae which settle on the old bark, the latter not completing growth until next spring, thus completing the monoeceus, monomorphic annual fir cycle. The former reach maturity between May and July, depending on the weather, and lay a small number of eggs, all of which hatch into winter stem mother larvae. Part of the summer larvae develop into nymphs which are only covered by powder. These change into winged migrants, all of which fly about May or June and settle on young and old needles of *Picea excelsa*. The 7-12 eggs which these lay there hatch into the sexed forms. In but four instances were these eggs observed to have hatched and partly developed. from the hiemalis larva, which fully agrees with Börner's description of it, we know nothing of its other forms in this country.

Economically Chermes piecae is regarded by some observers in Europe to have been the cause of the serious injury and death of many fir trees in a number of places. But those observations were made prior to its differentiation from Chermes nüsslini, which is known to infest fir trees simultaneously with the other, and, the writer is inclined to agree with Nüsslin that, of the two species, the one sapping the vitality of the young growth is probably the more seriously injurious, the two together probably being quite competent to kill good sized fir trees. Hence, if nüsslini is also found on the trees in New Hampshire reported dying, these two species of Chermes may account for the deaths. Otherwise, some other cause will probably be found primarily responsible. But the heaviness of the infestation on the pieces of bark examined would indicate that the species merits watching and further careful study. It goes without saying that it likewise merits study from

the biological view point.

NOTES ON A LITTLE-KNOWN RABBIT EAR-MITE.1

(Psoroptes cuniculi Mégnin.)

BY A. B. DUCKETT.

Truck Crop and Stored Product Insect Investigations.

Author's abstract.

During April, 1915, two rabbits used by the Bureau of Entomology for experimental purposes died from the effects of rabbit ear mange. The disease was found to be caused by this mite, not previously recorded in America, and an autopsy showed cerebral disturbances, the mites having penetrated to within five millimeters of the brain. All stages of the mite were found on waste material, such as skin, blood, and wax, and cast skin that had accumulated near the base of the ear passage. This copious supply of organic matter undoubtedly favors development and when once the mites gain a foothold the progeny increase at a prodigious rate. Eggs are laid singly on waste material. The mite which Mégnin called P. longirostris var. cuniculi is said by Banks to be a distinct species. Since rabbits afflicted with the disease show marked symptoms of illness, the writer is of the opinion that this parasite can be greatly curtailed and perhaps entirely subjugated with a little concerted effort on the part of the fanciers.

In connection with the above species of mite, the writer also records another European mite, *Listrophorus gibbus* Pasquest. found by Mr. W. H. White in the hair of rabbits. According to Mr. Banks, who determined the species, this is the first record of the occurrence of this mite in America.

Two Hundred and Ninetieth Meeting, December 2, 1915.

The 290th meeting of the Society was entertained by Mr. W. D. Hunter at the Saengerbund Hall, December 2, 1915. There were present Messrs. Abbott, Böving, Busck, Caudell, Craighead, Crawford, Cushman, DeGryse, Ely, Fisher, Gahan, Greene. Heidemann, Heinrich, Hopkins, Hunter, Hutchison, Isely, Kewley, Knab, McIndoo, Middleton, Pierce, Quaintance, Rohwer, Rust, Sasscer, Schwartz, Shannon, Snyder, Townsend, Turner, Van Dine and Walton members, and A. I. Fabis, R. M. Garner, Max Kisliuk, Alden Speare, and K. H. Townsend visitors.

The following officers were elected for the ensuing year: President, Prof. Chas. R. Ely; First Vice-President, Mr. E. R. Sasseer;

¹ Published in full in Journ, Amer. Vet. Med. Assoc. 1915.

Second Vice-President, Mr. Frederick Knab; Recording Secretary, Mr. A. B. Gahan; Editor, Mr. J. C. Crawford; Corresponding Secretary-Treasurer, Mr. S. A. Rohwer; members of the Executive Committee at Large, Mr. A. L. Quaintance, Mr. E. A. Schwarz and Mr. W. D. Hunter.

For Vice-President of the Washington Academy of Sciences Mr. W. D. Hunter was renominated.

Under the head of Program the following papers were presented:

NON-INTENTIONAL DISPERSAL OF MUSCOID SPECIES BY MAN, WITH PARTICULAR REFERENCE TO TACHINID SPECIES.

By Charles H. T. Townsend,

Bureau of Entomology, U. S. Department of Agriculture.

Setting out with the statement that we are considering only species which have access to ships lying in port in the country of origin, either coming aboard by their own locomotion or being brought aboard by man in material for shipment, we find that just two sets of conditions are necessary for effective dispersal to new countries:

(1) The conditions under which a given species normally breeds, or lives in either a quiescent or active state, must be maintained on shipboard *in transit* between the country of origin and the country of introduction.

(2) The same conditions must be at hand in the country of introduction immediately upon arrival of the species, in order that

it may establish and maintain itself.

The muscoid species whose maggets normally live in the dung of domestic animals are easily carried to all parts of the world where cattle and like animals are shipped. Such are *Promusca domestica*, Stomoxys calcitrans, Haematobia irritans, Muscina stabulans, Musca romitoria and crythrocephala, Lucilia caesar and sericata, etc. Both sets of conditions are present in these cases.

Contrasted with these are the cases of the screw-worm fly, Cochliomyia macellaria, whose maggots live in open sores of animals and in fresh carcases; and Cynomya mortuorum, whose maggots infest older carcases. While the second set of conditions may be present quite commonly in these cases, the first is practically always lacking. Hence these species are not spread. The first is confined to America, and has never been turned up elsewhere.

The second is confined to Europe, and has apparently never reached America. Such cases may be multiplied.

Just the opposite of the preceding are the cases of the parasitic muscoid species whose larvae live in caterpillars and other insect hosts, but whose pupae may remain for a short or long time dormant, according to temperature, in earth or other material commonly shipped. The first set of conditions is present in these cases; but the second is lacking, since the natural hosts do not exist in the country of introduction. Even when such hosts do exist in number, establishment is no easy matter for the species to effect, unaided. And still again, even when intentionally aided by man, establishment is a very complicated and difficult matter, not at all easily effected. This has been well illustrated by the work of the U.S. Bureau of Entomology with muscoid parasites at the Gipsy Moth Laboratory in Massachusetts. Although the natural hosts, the gipsy and browntail caterpillars, existed in great quantity in the country of introduction, yet colonization of over 68,000 individuals of at least 16 foreign species of the parasites had resulted up to the end of 1910 in the complete establishment of only two species, Compsilura concinnata Meigen and Zugobothria nidicola Townsend, and that after many years of persistent effort, carried out with the utmost regard for securing the requisite conditions at the right season. It is significant that the first species has a much wider host-range than the others, except Exorista larvarum Linn, with whose establishment a closely similar American species has interfered; while the second species is independent of alternate hosts, and finds practically no competition inasmuch as it is the only tachinid breeding in the hibernating browntail caterpillars.

I have repeatedly insisted that very few if any of the tachinid species hitherto announced as common to Europe and North America are in reality so. This is demonstrable in many cases by a comparative study of specimens. The reason, as above explained, is quite readily understood, once it is pointed out. To the cases of certain species, which appear to differ only in physiological characters, this reason lends emphasis. For example there is a species of Paraexorista in New England which Mr. W. R. Thompson was unable to separate on anatomic characters from the European Paraexorista cheloniae, yet he proved it a distinct species by the fact that it would not attack the browntail caterpillars, of which the European species is one of the most efficient parasites. In this connection, the fact must be emphasized that the existence of a closely similar species in the country of introduction constitutes a bar to establishment, since the foreign species is often practically swallowed up by the native species through interbreeding, the issue apparently inheriting the physio-

logical characters of the latter.

Again, there exist in western North America tachinid species which seem indistinguishable on external characters, both anatomic and colorational, from European species. Catharosia calva Coq., of Idaho, can not be told from C. pygmaea Fall., of Europe. It does not occur in eastern North America so far as known. Cases of this class may be multiplied, but this will suffice as example. These species are evidently distinct from the European.

The purpose of this communication is to state the principles involved in commercial dispersals, citing a few examples in illustration; and particularly to emphasize the danger of attempting to identify species outside their natural faunal limits. In making determinations, for example, of European species in the American fauna, the principles governing dispersal must be most seriously considered.

HORISMOLOGY OF THE HYMENOPTEROUS WING.

By S. A. Rohwer, Forest Entomology, and A. B. Gahan, Cereal and Forage Crop Insects,

Bureau of Entomology, Washington, D. C.

Introduction.

Anyone who has attempted to do serious systematic work in the Hymenoptera cannot but have experienced difficulty in interpreting the meaning of certain authors in their description of wing venation. The lack of a uniform system of nomenclature, has caused the application in many cases of several names to the same vein or cell, while in other instances the same name has been applied to two or more different parts of the wing. Unless an author has indicated the authority whom he proposes to follow in naming the parts of the wing or has otherwise explained his own system it often becomes a puzzle to be certain of his meaning.

The difficulty experienced in such instances with the consequent loss of time entailed, has caused us to feel the need of a key to the synonymy of venational terms as well as a uniform set of names to be used in our own work.

It is the intention, therefore, to here present in so far as possible a complete and uniform nomenclature for the wing veins and wing cells of Hymenoptera, together with a synonymical index to wing nomenclature compiled from the works of the most prominent Hymenopterologists past and present. Figures illustrating all of the more striking types of venation found in the order are included. From a study of these figures it will be possible, we hope, for the student to correctly apply the nomenclature to any wing in the order, and also by reference to the synonymical list to interpret the meaning of the terms used by others in the past.

In the nomenclature adopted in this work no attention has been given to priority, although the intention has been to choose those names which have, by long usage, become most familiar, and to avoid, except where necessary or desirable, the proposal of new names.

In the naming of the hind wings the same system has been followed as for the front wing, in so far as practicable with the exception that to the name of each vein and cell the diminutives "ella" and "ellan" are added in order to distinguish the parts of the forewing from those of the hindwing and avoid the necessity of each time stating to which wing the reference is meant.

The system of wing nomenclature proposed by Woodworth (1906) contains some interesting features but these cannot be considered to be of any special value to the taxonomists nor do they enable one to understand the terminology used by previous systematists. Woodworth's paper can only be useful to the

morphologist.

Those who advocate the advantages of the Comstock-Needham system of terminology will no doubt regret that this system has not been used as the basic terminology here. We believe that this system possesses no appreciable advantages to the systematist while it does have certain disadvantages; first, that in the groups where the venation is much reduced the formula becomes long and cumbersome as well as meaningless (as in the Chalcids); second, the system is founded on insufficient investigation and future studies will necessitate repeated changes to agree with the facts. We believe it is much better for taxonomic work to designate a given area by a given name and call it that regardless of its possible homologies or analogies. As a system of designating veins and cells for the morphologist the Comstock-Needham system possesses certain advantages, but as a terminology to be used in taxonomic work we do not believe it is desirable.

DEFINITION AND SYNONYMY.

In cases where a vein is divided into sections by an intersecting vein or veins these sections are called abscissae and in longitudinal veins are numbered from the base of the vein.

The number of abscissae of a given vein may vary in different groups or even in the same group, their number being determined by the number of points of intersection, e.g., in figure 1 cubitus is divided into seven abscissae and in figure 2 into five.

A. THE FOREWINGS WITH MANY VEINS.

The nomenclature adopted for the forewing is, with a few modifications and additions, that used by Cresson which has been

quite generally followed by later Hymenopterists. The principal departures from that system are in the introduction of the terms brachius, anal, intercalaris, intercosta and prenervulus, as names for veins and crossveins, changing the term transverse median nervure to nervulus and the use of the prefix "inter" instead of transverse for the cubital and radial crossveins. Cresson's second discoidal cell is changed to first brachial cell and his first apical cell to second brachial.

The application in some cases of distinct names to the different sections of longitudinal nervures (e.g., the first longitudinal vein equals costa + stigma + metacarpus) may seem unwise at first sight to morphologists and even to systematists but we believe that for descriptive purposes it is desirable since it makes possible more exactness in descriptions. The terms interealarial cell, prenervulus and interradius are new terms, all others having been used before in wing nomenclature and with the same meaning as used here except in the case of the brachius, and anal veins.

Section I.—Cells.

Costal cell.—I in all figures.

The area between costa (or in some cases intercalaris) and subcosta, basad of stigma. In Chalastogastra often divided by intercosta; in Clistogastra occasionally wanting.

Synonyms: Costal cell—Norton 1867, Shuckard, Cameron 1882, Marlatt 1894, Fernald 1906, Cockerell and Robbins 1910. Costal area—Kirby. Area costalis—Dahlbom 1845. Cellule costale—Lacordaire 1834, de Romand. Cellula costalis—Dahlbom 1845, Thomson. Costalzelle—Schmiedeknecht 1907, Kieffer 1912. Costalcelle—Neilsen and Henriksen 1915. Areola costalis—Haliday. Cellule brachiale—Lepeletier 1825, André 1879. Premier cellule brachiale—Lepeletier 1836. Arcola brachialis—André 1879. Areola subbrachialis—Hartig. Areola submarginalis—Foerster 1877. Cellula intercubitalis—Dahlbom. Intercostalfeld—Konow 1901. Arcola mediastina—Nees. Schulterzelle—Mayr. C+Sc₁—Fernald 1906. C—Bradley 1908. SeM (= 1st costal), Sc₁ (= 2nd costal)—Comstock and Needham 1898, MacGillivray 1906. Sc— (first costal) Comstock and Needham 1898.

Intercalarial cell.—Fig. 1, X.

The area between intercalaris and costa. Present only in Chalastogastra with generalized venation.

Synonyms: C—Comstock and Needham 1898.

Radial cell or cells.—II and supernumbers in all figures.

The area bounded posteriorly by the radius and anteriorly by stigma, metacarpus or the margin of wing or a combination of two or all of these. In Chalastogastra often divided by one or more cross-veins (interradii). Where there are more than one cell they are numbered from base of wing out.

Synonyms: Radial cell-Shuckard, Norton 1867, Cameron 1882, Cresson 1887, Marlatt 1894, Morley 1903, Fernald 1906. Radial arcolet-Marshall 1885. Radial cellule—Say 1825. Cellule radialis—André 1879. Arcola radialis-Haliday, Foerster 1877. Cellule radiale-Saussure 1852, Jurine 1807, Lepeletier 1825, Lacordaire 1834, de Romand, Sichel, Berthoumieu 1904. Cellula radialis-Dahlbom 1845, Gravenhorst, Costa. Radialfeld-Konow 1901. Radialzelle-Ratzeburg 1848, Hartig, Zaddach, Kohl 1896, Széligeti 1904, Schmiedeknecht 1907, Dalla Torre and Kieffer 1910, Friese 1911, Enslin 1912, Kieffer 1912. Radialcellar-Nielsen and Henriksen 1915. Marginal cellule—Say 1825. Marginal cell—Norton 1867, Smith, Cresson 1887, Ashmead 1900, Cockerell and Robbins 1910. Arcola marginalis-Latreille, Thomson. Margin Cell-Shuckard. Area costalis -Fallén. Costal area-Kirby. A pical cell-Morley 1903. 1st R_1 (= first radial) Comstock and Needham 1898, MacGillivray 1906. $2d R_1 - (=$ second radial) Comstock and Needham 1898, MacGillivray 1906. R₂ -(= third radial) Comstock and Needham 1898, MacGillivray 1906. 2dR₁ $+R_2$ —Fernald 1906, Bradley 1908. Cell III_{1+2} —(as in bees) Robertson 1902 a, 1902 b, 1903 c.

Appendiculate cell.—(Not illustrated.)

The usually incomplete cell formed by the metacarpus or anterior margin of wing and a spurious branch or extension of radius beyond the end of the radial cell. Occurs in many groups but is seldom of taxonomic importance.

Synonyms: Appendicular Cell—Cameron 1882. Areola appendicea—Hartig, Foerster 1877, André 1879. Cellula appendicea—Costa. Cellula appendicée—André 1879. Anhangszelle—Kohl 1896, Konow 1901, Enslin 1912. Vedhacngscelle—Nielsen and Henriksen 1915. Appendiculate cell—Marlatt 1894.

Cubital cell or cells.—III and supernumbers in all figures when present.

The area between the radius and cubitus, often divided by a number of crossveins in which ease the cells are numbered from the base of the wing to the apex. In Ichneumonidae and certain other Clistogastra the first abscissa of cubitus is wanting and the first cubital is confluent with the first discoidal. In Ichneumonidea and Cynipoidea the second cubital is greatly reduced in size and is termed arcolet.

Most writers have been consistent in designating this area and have numbered the cells from the base outward as can be seen from the following synonymy. In certain cases however authors have definitely named certain cells by an additional word or prefix; and

in these cases they are listed under the cell to which they definitely refer.

Synonyms: Cubital cells—Ratzeburg 1848, Norton 1867, Shuckard, Cameron 1882, Marlatt 1894, Fernald 1906. Arcola cubitalis—Foerster 1877, André 1879. Cubital cellule—Say 1825. Cubital arcolet—Marshall 1885. Cellule cubitale—Dahlbom 1845, Jurine 1807, Lepeletier, Lacordaire 1834, Wesmael, de Romand, Saussure 1852, André 1879, Siehel, Morley 1903, Berthoumieu 1904. Cellula cubitalis—Costa. Cubitalzelle—Hartig, Zaddach, Mayr, Kohl 1896, Schmiedeknecht 1907, Friese 1911, Enslin 1912, Kieffer 1912, Konow 1901, Szépligeti 1904. Cubitalfeld—Konow 1901. Cubitalcelle—Nielsen and Henriksen 1915. Submarginal cellule—Say 1825. Submarginal cells—Norton 1867, Cresson 1887, Smith. Arcola submarginalis—Latreille. Cellula submarginalis—Thomson.

Synonymy of the First cubital cell: Erste cubitalzelle—Dalla Torre and Kieffer 1910. Areola costalis—Dahlbom. Cellula cubitalis interna—Gravenhorst. Middle Areole—Kirby. Areola intermedia—Fallén. R+1st R₁—Fernald 1906, Bradley 1908. R—Comstock and Needham 1898, MacGillivray 1906.

Synonymy of the Second cubital cell: $Areola\ intermedia$ —Dahlbom. $Cellula\ intermedia$ —Gravenhorst. R_5 —Comstock and Needham 1898, MacGillivray 1906, Fernald 1906. R_{4+5} —Bradley 1908. $Cell\ III_5$ —Robertson 1902 a, 1902 b, 1903 a, 1903 c.

Synonyms of the areolet: Arcolet—Cresson 1887, Ashmead 1900, Morley 1903. Arcola—Gravenhorst, Schmiedeknecht 1907, Dalla Torre and Kieffer.

Synonymy of the Third cubital cell: $Areola\ terminalis$ —Dahlbom. $Cellula\ externa$ —Gravenhorst. $Dritte\ Cubitelzelle$ —Dalla Torre and Kieffer 1910. R_4 —Comstock and Needham 1898, MacGillivray 1906, Fernald 1906. R_3 —Bradley 1908. $Cell\ III_4$ —Robertson 1902 a, 1902 b.

Synonymy of the Fourth cubital cell: Apical arcole—Kirby. R₃—Comstock and Needham 1898, MacGillivray 1906, Fernald 1906.

Median cell.—IV in all figures.

The area basad of basal vein and between the subcosta (or costa) and medius.

Synonyms: Median cell—Cresson 1887, Fernald 1906. Medial cell—Cockerell and Robbins 1910. First medial cell—Norton 1867. Cellule mediane—de Romand. Medialzelle—Schmiedeknecht 1907, Kieffer 1912, Konow 1901. Medialfeld—Konow 1901. Aussere Mittelzelle—Mayr. Externo medial cell—Shuckard. Externo-median cell—Cresson 1887. Area costalis—Fallén, Dahlbom. Arcola costalis—André 1879. Cellule costale—André 1879, Berthoumieu 1904. Subcostal cell—Marlatt 1894. Cellule sous-costale—Lacordaire. Humeral cell—Cameron 1882. First humeral cell—Ratzeburg 1848. Premiére cellule humerale—Wesmael. Arcola humeralis antica—Foerster 1877. Cellule humeralis externa—Gravenhorst.

First brachial cell—Norton 1867. Areola brachialis anterior—Nees. Deuxieme cellule brachiale—Lepeletier. Praebrachial areolet—Marshall 1885. Areola praebrachialis—Haliday. Intermediate area—Kirby. First basal cell—Morley 1913. M—Comstock and Needham 1898, Bradley 1908, Mac-Gillivray 1906. Cell Ist IV—Robertson 1904.

Discoidal cells. -V and supernumbers in all figures where they occur.

The area beyond basal and bounded anteriorly by the cubitus and posteriorly by discoideus and subdiscoideus, often divided by two cross-veins (recurrents) in which case the cells are numbered from the base of the wing towards the apex.

This area has been treated a number of different ways which has been the cause of some confusion. Many authors have included the first brachial as a discoidal and have excluded the third discoidal numbering the three cells either right or left from the first.

Certain authors have treated the discoidal cells as is proposed in this paper. In the great majority of cases it is necessary, however, to list the synonymical terms under each cell.

Synonyms: Cellula discoidale—Dahlbom 1845. Discoidal cells—Norton 1867. Arcola discoidalis—Foerster 1877. Discoidalzellen—Schmiedeknecht 1907. Discoidalcellar—Nielsen and Henriksen 1915.

Synonymy of the First discoidal cell: First discoidal cell—Shuekard, Cameron 1882, Ashmead 1900, Cresson 1887, Fernald 1906, Cockerell and Robbins 1910. Discoidal cell—Smith. Erste discoidalzelle—Ratzeburg 1848, Zaddach, Kohl 1896, Friese 1911. Cellulc discoidale—André 1879. Arcola discoidalis prima—Foerster 1877, André 1879. Cellula discoidalis prima—Costa. Discoidalzelle—Mayr, Konow 1901, Enslin 1912, Kieffer 1912. Première cellule discoidale—Lepeletier 1825. Deuxième cellule discoidale—de Romand. Cellula discoidalis interior—Gravenhorst. Cellule discoidale superieure externa—Wesmael. First discal cell—Marlatt 1894. Arcola exterior—Haliday. Arcola praediscoidalis—Haliday. Praediscoidal arcolet—Marshall 1885. Arcola costalis—Fallén. Cellula furcata—Thomson. M4—Comstock and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908. Cell 2nd IV—Robertson 1904.

Synonymy of the Second discoidal cell: Second discoidal cell—Cameron 1882, Banks 1912. Cellule discoidale 2—André 1879. Zweite Discoidalzelle—Zaddaeh, Kohl 1896, Friese 1911. Areola discoidalis secunda—Foerster 1877, André 1879. Cellula discoidalis secunda—Costa. Cellule discoidale—Berthoumieu 1904. Cellula discoidalis—Thomson. Second discal cell—Marlatt 1894. First discoidal cell—Morley 1903. Third discoidal cell—Shuckard, Cresson 1887, Fernald 1906, Coekerell and Robbins 1910. Troisieme cellule discoidale—Lepeletier 1836, de Romand. Cellule discoidale inferieure—Lepeletier 1825, Wesmael. Cellula discoidalis intermedia—Gravenhorst. Areola exterior—Haliday. Arcola intermedia—Graven-

horst. Areola specularis—Dahlbom, Fallén. Medialzelle—Konow 1901. $1stM_2$ —Comstock and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908. Discoidalzelle—Szépligeti 1904.

Synonymy of the Third discoidal cell: Third discoidal cell—Morley 1903. Arcola discoidalis tertia—Foerster 1877. Troisieme cellule discoidale—Dahlbom, Sichel. Quatrieme cellule discoidale—de Romand. Arcola externa media—Haliday. Premiere cellule du limbe—Lepeletier. Medialzellen—Konow 1901. Erste Hinterzelle—Zaddach. Second apical cell—Shuckard, Cresson 1887, Fernald 1906. First posterior cell—Cameron 1882, Marlatt 1894. Cellule posterieures—André 1879. Arcola posterior prima—André 1879. Cellula postica externa—Gravenhorst. M₁—Comstock and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908.

Discocubital cell.—Fig. 5, V¹ and HI¹.

The combination of the first cubital and first discoidal cells due to the loss wholly or in part of the first abscissa of cubitus. The usual condition in Ichneumonidae but also found in other groups e.g., Braconidae and Sphecoidea.

Synonyms: Disco-cubital cell—Cresson 1887, Ashmead 1900. Cellula discocubitalis—Schmiedeknecht 1907. First cubital cell—Morley 1903 but in other works uses term discocubital. Discocubitalzelle—Szépligeti 1905.

Submedian cell.—VI, in all figures where it occurs.

The area based of nervulus and between medius and submedius.

Synonyms: Submedian cell—Cresson 1887, Ashmead 1900, Fernald 1906, Cockerell and Robbins 1910. Erste Submedialzelle—Kohl 1896. Submedialzelle—Schmiedeknecht 1907, Kieffer 1912. Area submedialis prima— Kohl 1896. Cellule sous-mediane—de Romand. Cellula submedialis [basal] —Dahlbom 1845. Median cell—Cameron 1882, Marlatt 1894. Cellule mediane-Lacordaire 1834, André 1879, Berthoumieu 1904. Arcola media-André 1879, Second median cell—Norton 1867, Interno-medial cell— Shuckard, Cresson 1887. Innere Mittelzelle-Mayr. Arcola humeralis media interna—Foerster 1877. Arcola humeralis media—Hartig. Cellula humeralis intermedia—Gravenhorst. Zweite humeralzelle—Ratzeburg 1848. Deuxieme cellule humerale-Wesmael. Second brachial cell-Norton 1867. Troisieme cellule brachiale—Lepeletier, Brachialfeld—Konow 1901. Brachialcelle-Nielsen and Henriksen 1915. Pobrachial arcolet-Marshall 1885. Second basal cell—Ashmead 1893, Morley 1903. Vordere-mittelere Schulterzelle—Szépligeti 1904. Anal eell—Ashmead 1900 (p. 66). Cu+Cu₁—Mac-Gillivray 1906, Fernald 1906, Bradley 1908. Cu (first submedian)—Comstock and Needham 1898. Cell VI—(first and submedian) Robertson 1904. Cu₁ (second submedian)—Comstock and Needham 1898. Cell V— (second submedian) Robertson 1904.

Brachial cells.—VII and supernumbers in figures where they occur.

The area beyond the nervulus and bounded anteriorly by discoideus and subdiscoideus and posteriorly by brachius and the posterior margin of the wing. Usually separated by the anteroposterior part of discoideus, and numbered from the base of the wing. The brachial cells as defined in this paper have been variously treated and it is necessary to list the synonyms separately. It appears no other writers have used the same definition as the one used here.

First brachial cell.

This cell has been commonly called second discoidal in America, but in Europe three writers, Thomson, Schmiedeknecht and Berthoumieu, have designated it as brachial.

Synonyms: Second discoidal cell-Cresson 1887, Ashmead 1900, Morley 1903, Fernald 1906, Cockerell and Robbins 1910. Cellule brachiale—Berthoumieu 1904. Zweite Discoidalzelle-Ratzeburg 1848, Szépligeti 1904. Deuxieme cellule discoidale superieure-Lepeletier 1825. Area submedialis secunda—Kohl 1896. Cellula submedialis [outer]—Dahlbom 1845. Deuxieme cellule discoidale—Lepeletier 1836. Zweite submedialzelle—Kohl 1896. Areola discoidalis tertia-André 1879. Cellula discoidalis tertia-Costa. Dritte Discoidalzelle-Zaddach. Cellule discoidale internc-Wesmael. Hintere-mittlere Schulterzelle—Szépligeti 1904. Hintere Discoidalzelle— Kieffer 1912. Cellule sous-discoidale-de Romand. Third discal cell-Marlatt 1894, Cellula secunda brachialis—Thomson. Brachialzelle— Szépligeti 1905, Schmiedeknecht 1907. Cellule mediana [apical]-Lacordaire 1834. Distale Submedianzelle-Kieffer 1912. Arcola humeralis media externa—Foerster 1877. Cellula postica interna—Gravenhorst. Arcola posterior-Haliday. Podiscoidal arcolet-Marshall 1885, Haliday. Middle areole—Kirby. Analzelle—Konow 1901. Inner a meal cell—Norton 1867. M₃—Comstock and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908. Cell V₁—Robertson 1904.

Second brachial cell.

Synonyms: First apical cell—Shuckard, Cresson 1887, Fernald 1906. Outer apical cell—Norton 1867. Apical arcole—Kirby. Cellule apicale—de Romand. Area terminalis—Dahlbom. Cellula discoidalis externa—Gravenhorst. Cellule anale—Wesmael, Haliday. Cellula apicalis—Dahlbom 1845. Anal cell—Marshall 1885, Morley 1903. Second posterior cell—Cameron 1882, Marlatt 1894. Arcola posterior secunda—André 1879. Deuxieme cellule du limbe—Lepeletier. Area specularis—Nees. Aussere Hinterzelle—Zaddach. 2dM2—Comstock and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908.

Anal cell or cells.—VIII and supernumbers in figures where they occur.

The area immediately behind submedius and brachius and, in all Hymenoptera in which the anal vein is absent, bounded posteriorly by the hind margin of the wing; in those Chalastogastra in which the anal vein is present it forms the posterior boundary of the cell. In those Chalastogastra in which the anal vein is present the anal cell is of considerable taxonomic value as it is either open and constricted basally, or with the interanal crossvein present (fig. 1), or contracted and closed medially, or petiolate (fig. 2). This term has been used generally for the area as it occurs in Clistogastra while the closed anal cell of the Chalastogastra has been variously designated (in America usually as lanceolate cell), but inasmuch as it is impossible to determine whether the anal vein has faded out or has coalesced with submedius and brachius we prefer the above definition.

Synonyms: Anal cell—Shuckard, Cresson 1887, Cockerell and Robbins 1910, Fernald 1906. Areola analis—André 1879. Anal area—Kirby. Cellula analis—Costa, Dahlbom 1845. Cellula anale—Lacordaire 1834, de Romand, Berthoumieu 1904. Cellula humeralis interna—Gravenhorst. Cellula humerale—Wesmael. Area humeralis lanceolata—Foerster 1877. Humeralfeld—Konow 1901, Enslin 1912. Humeraleelle—Nielsen and Henriksen 1915. Hinter Schulterzelle—Szépligeti 1904. Lanceolate cell—Norton 1867, Cameron 1882, Marlatt 1894, Rohwer 1910. Cellula lanceolée—Hartig, André 1879. Lanzettförmige Zelle—Zaddach, Konow 1901, Schmiedeknecht 1907, Enslin 1912. Lanceteelle—Nielson and Henriksen 1915. Third basal cell—Morley 1903. Axillary areolet—Marshall 1885. 1stA—(first anal, in Chalastogastra) Comstock and Needham 1898, MacGillivray 1906. 2dA—(second anal, in Chalastogastra) Comstock and Needham 1898, MacGillivray 1906. 3dA—(in Clistogastra) Fernald 1906, Bradley 1908.

Posterior cell.—Figs. 1, 2, IX.

The area posterior to the anal vein, when present, and bounded posteriorly by the hind margin of the wing. Present only in certain Chalastogastra.

Synonyms: Cellula postica—Dahlbom. Area humeralis postica—Hartig, Foerster 1877. Analfeld—Konow 1901. 3dA—Comstock and Needham 1898, MacGillivray 1906.

Costa.—Fig. 1, AX¹B; figs. 2, 5, 6, 8, 9, 10, AB.

The vein on the anterior margin of wing from base to stigma, in some wings enlarging somewhat before the stigma and this enlarged portion has been termed parastigma. In many Clisto-

gastra, costa and subcosta are combined, or nearly, and in these cases the combined veins are known as costa. Most authors have considered that the costa was the entire vein or the anterior margin of the wing (costa + stigma + metacarpus).

Synonyms of costa: Costa—Marshall 1885, Morley 1903, MacGillivray 1906. Costalader—Szépligeti 1904. Costalis—Kieffer 1912. C—Comstock and MacGillivray 1898, MacGillivray 1906, Fernald 1906, Bradley 1908.

Synonyms of costa + metacarpus: Costa—Latreille, Thomson, Cameron 1882, Cresson 1887, Konow 1901, Morice 1903, Fernald 1906, Schmiedeknecht 1907, Enslin 1912. Costal vein—Norton 1867, Marlatt 1894. Costal nervura—Kirby, Shuckard, Coekerell and Robbins 1910. Nervure costal—Lacordaire 1834, André 1879, Berthounieu 1904. Nervure costalis—Schenck, Fallén, Dahlbom, Haliday, André 1879. Costalaure—Nielsen and Henriksen. Costa marginalis—Mayr. Vena marginalis—Foerster 1877. Radius—Jurine, Hartig, Saussure 1852. Radius superior—Lepeletier. Première nervure humerale—Wesmael. Randader—Zaddach. Randnerv—Zaddach. Randrippe—Mayr. La racine—Tosquinet 1896. Le cote—Saussure 1852.

Intercalaris.—Fig. 1, XX1.

A longitudinal vein parallel with the anterior margin of the wing, occurring in the costal cell of some of the more generalized wings of Chalastogastra; lying between costa and subcosta with its basal end at the base of the wing and its apical end either on costa or subcosta or branched, one branch terminating on costa and the other on subcosta.

Synomyms: Vena intercalaris—Foerster 1877. Nervus intercalaris—André 1879. Nervure intercalaire fourehue—André 1879. Intercostalader—Konow 1901, Enslin 1912. Intercostalaare—Nielsen and Henriksen 1915. Nervus mediastinus—Thomson. Sc—Comstock and Needham 1898, Mac-Gillivray 1906.

Intercosta. Fig. 2, YY1.

A cross-vein in some Chalastogastra dividing the costal cell, usually at about its apical fourth and having its anterior end on costa and its posterior end on subcosta.

Synonyms: Intercostalnerv—Konow 1901. Intercostalquernerv—Enslin 1912. Intercostaltvaeraare—Nielsen and Henriksen 1915. Transverse costal vein—Marlatt 1894. Vena transverse-submarginalis—Foerster 1877. Nevvus transverse-brachialis—André 1879.

Subcosta. Figs. 1, 2, EGB; fig. 7, EHB; figs. 8, 9, EB; fig. 40, EE¹.

The first basal longitudinal vein from costa (when intercalaris is wanting) and parallel with it, extending from base of wing to

stigma. In some Clistogastra the subcosta is combined with the costa and is considered wanting, being termed costa, q. v.

Synonyms: Subcosta-Kohl 1896, Konow 1901, Morice 1903, Fernald 1906, Schmiedeknecht 1907, Enslin 1912. Subcostalis-Dalla Torre and Kieffer 1910, Kieffer 1912. Subcostal vein-Marlatt 1894. Nervus subcostalis—Nees, Haliday, André 1879, Subcostal nervure—Cameron 1882, Cockerell and Robbins 1910. Nervure sous-costale—Lacordaire 1834, Subcostalaare-Nielsen and Henriksen 1915. Postcosta-André 1879. Latreille, Thomson, Kohl 1896. Postcostal nervure—Kirby, Shuckard. Nervure post-costale—de Romand. Nervus postcostalis—Thomson. Vena postcostalis-Dahlbom 1842. Vena submarginalis-Foerster 1877. Nervus auxiliaris-Schenck, Fallén, Dahlbom. Costa scapularis-Mayr. Schulterrippe-Mayr. Unter-randnerv-Zaddach. Cubitus-Jurine, Hartig, Say 1825, Saussure. Cubitus superieur-Lepeletier. Première nervure humerale—Wesmael. Se+R+M-MacGillivray 1906, Fernald 1906. Bradley 1908. R+M-Comstock and Needham 1898 (fig. 48), MaeGillivray 1906. R—Comstock and Needham 1898.

Stigma.—Figs. 1, 2, 5, 6, 8, 9, 10, BC.

The triangular, lanceolate or oval and greatly thickened portion of the vein on the anterior margin of the wing and located at or near the middle.

Synonyms: Stigma—Gravenhorst, Say 1825, Shuckard, Wesmael, Dahlbom, de Romand, Thomson, Nees, Norton 1867, Marshall 1885, Cresson 1887, Kohl 1896, Ashmead 1900, Konow 1901, MacGillivray 1906, Fernald 1906, Schmiedeknecht 1907, Friese 1911, Enslin 1912, Nielsen and Henriksen 1915. Apterostigma—Wheeler 1910, Carpus—Say 1825, Zaddach, Foerster 1877. Carpe—Laeordaire 1834. Punctum eostale—Fallén. Randmal—Hartig, Szépligeti 1904. Le point—Jurine. Le point epais—Lepeletier. Point epais—Saussure. Vingemaerke—Nielsen and Henriksen 1915. Ramus marginalis—Szépligeti 1904. Punctum—Say 1825. Pterostigma—Kohl 1896. Flügelmal—Kohl 1896.

Metacarpus.—Fig. 1, CRD; figs. 2, 5, 6, 8, 9, 10, CH¹D.

The vein on the anterior margin of wing beyond the stigma.

Synonyms: Metacarpus—Marshall 1885, Morley 1903. Ramus post-marginalis—Szépligeti 1904. R₁—MaeGillivray 1906, Fernald 1906.

Radius.—Fig. 1, HLD; fig. 2, HMH¹: figs. 5, 6, 9, HKH¹; figs. 7, 8, HLH¹: fig. 10, KH¹.

The first apical longitudinal vein from metacarpus, usually originating from stigma, although in some Chalastogastra it originates on subcosta and in all cases extending towards (sometimes attaining) apex of wing.

Synonyms: Radius—Lepeletier 1825, Say 1825, Schenck, Dahlbom, Wesmael, Ratzeburg, Haliday, Cresson 1887, Marshall 1885, Ashmead 1900, Konow 1901, Morice 1903, Fernald 1906, Schmiedeknecht 1907, Enslin 1912. Radialis—Dalla Torre and Kieffer 1910, Kieffer 1912. Vena radialis—Dahlbom 1845, Hartig, Foerster 1877. Radial vein—Cameron 1882, Marlatt 1894. Nervus radialis—André 1879. Radial nervure—Shuckard. Nervure radiale—Lacordaire 1834, de Romand, Siehel, André 1879. Radius inférieur—Lepeletier 1836. Radialader—Szépligeti 1904, Kohl 1896. Radialaare—Nielsen and Henriksen 1915. Nervus radialis—Berthoumieu 1904. Nervus marginalis—Thomson. Marginal vein—Norton 1867, Cresson 1887. Marginal nervure—Cockerell and Robbins 1910. Subradialader—Zaddaeh. Basis-radii—Used by Schmeideknecht 1907 for first abscissa. Section 3 of vein III—Robertson 1903 b.

Interradius, ii.—Fig. 1, QQ¹ and RR¹.

A cross-vein, or veins, connecting radius and stigma or radius and metacarpus, and dividing the radial cell. Occur only in Chalastogastra and one or two small groups of Clistogastra.

Synonyms: Vena transverso radialis—Foerster 1877. Nervi transversoradialis—André 1879. Nervure transverso radiale—André 1879. Transrerse radial—Cameron 1882, Marlatt 1894. Radialquernerv—Konow 1901, Schmiedeknecht 1907. Enslin 1912. Radialtaeraare—Nielsen and Henriksen 1915. Radialschneidnerv—Zaddach. Nervures recurrentes radiales —de Romand. Transverse marginal vein—Norton 1867. r—(first interradius) MacGillivray 1906. R₂—(second interradius) Comstock and Needham 1898, MacGillivray 1906. ev—(first interradius) Comstock and Needham 1898.

${\bf Appendiculate.} \hbox{--} (Not\ illustrated.)$

The continuation of radius (or metacarpus?) from the posterior apical end of radial cell towards the end of the wing, forming the posterior boundary of the appendiculate cell.

Synonyms: Appendice de la radial—André 1879.

Cubitus.—Figs. 1, 2, 6, GIG¹; fig. 5, K¹NG¹; figs. 7, 10, GK¹ G¹; fig. 8, GIM¹; fig. 9, GIK¹G¹.

The second apical longitudinal vein from the metacarpus and forming the posterior boundary of the cubital cells. In Clistogastra usually originating at basal vein (fig. 6, 8, 9, 10) and extending to near apex of wing. In Chalastogastra usually originating at subcosta (fig. 1, 2) and extending to near apex of wing. In those Clistogastra in which the first abscissa of cubitus is wanting the cubitus has its basal end at first intercubitus or the position this vein would occupy if it were present.

Synonyms: Cubitus—Lepeletier 1825, Dahlbom, Wesmael, Zaddach. Ratzeburg 1848, Haliday, Marshall 1885, Ashmead 1900, Konow 1901, Morice 1903, Fernald 1906, Enslin 1912. Cubitalis—Dalla Torre 1910. Kieffer 1912. Vena cubitalis—Dahlbom 1845, Hartig, Foerster 1877. Nervus cubitalis—André 1879. Cubital vein—Cameron 1882, Cresson 1887. Marlatt 1894. Cubital nervure—Shuckard, Cockerell and Robbins 1910. Nervure cubitale—Lacordaire 1834, de Romand, Siehel, André 1879. Cubitalaare—Nielsen and Henriksen 1915. Cubitus inférieur—Lepeletier 1836. Cubitalrippe—Mayr. Submarginal vein—Norton 1867. Vena submarginalis—Thomson.

Intercubiti.—Figs. 1, 2, 5, 6, 7, 8, 9, 10, KK¹, LL¹, MM¹.

The cross-veins connecting radius and cubitus, varying in number from one to three and numbered from the base of the wing out.

Synonyms: Transverso-cubitalis—Foerster 1877, Schmiedeknecht 1907, Kieffer 1912. Nervure transverso-cubitale—André 1879. Vena transversocubitalis-Dahlbom 1845. Venula transverso-cubitalis-Costa. verse cubitus—Cresson 1887. Transverse cubital—Cameron 1882, Marlatt 1894, Fernald 1906. Transverso cubital nervure—Shuckard, Cockerell and Robbins 1910. Nerrus transverso cubitalis-André 1879. Cubitalquernerv-Konow 1901, Schmiedeknecht 1907, Enslin 1912. Cubitalquerader-Kohl 1896, Szépligeti 1904, Friese 1911. Cubitaltvaeraare-Nielsen and Henriksen 1915. Cubital nerves-Morice 1903. Intercubital nervure-Marshall 1885. Cubitalseheidnerv-Zaddach. Transverse submarginal nervures-Norton 1867. Nervures recurrents cubitalis-de Romand. Nervi transrersi-Fallén. Nervus connectus-Dahlbom. Querrippe-Mayr. Radiomedial cross-vein—(first intercubitus) MacGillivray 1906. Fifth branch of radius—(second intercubitus) MaeGillivray 1906. Fourth branch of radius -(third intercubitus) MacGillivray 1906. r-m-(first intercubitus) Comstock and Needham 1898, Robertson 1902 b, 1903 a, c, MacGillivray 1906. r-m+Rs—(first intercubitus) Fernald 1906, Bradley 1908. R₅—(second intercubitus) Comstoek and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908. R₄—(third intercubitus) Comstock and Needham 1898, MacGillivray 1906, Fernald 1906, Bradley 1908. Vein III₅—(second intercubitus) Robertson 1902 a, 1902 b, 1903 a. Vein III4-(third intercubitus) Robertson 1903 b.

Medius.—Figs. 1, 2, 5, 6, 7, 8, FG¹; fig. 9, FG; fig. 10, FF¹.

The first basal longitudinal vein which diverges from the anterior margin of the wing; arising at the base of the wing or from subcosta near its base and forming the posterior boundary of the median cell and terminating at the basal vein. But few authors have considered that medius terminated at basal, many have extended it to include the basal portion of discoideus, while some have added to it subdiscoideus.

Synonyms of Medius: Nervus medius—André 1879 (in text but not fig.). Medialis—Kieffer 1912. Median—Fernald 1906. Medialader—Friese 1911. Externo medial nervure—Coekerell and Robbins 1910. Cu+m—Mac-Gillivray 1906, Fernald 1906. Cu+Cu₁—Bradley 1908. Cu—Comstock and Needham 1898.

Synonyms of medius plus base of discoideus: Vena media—Hartig. Median vein—Cameron 1882, Marlatt 1894, Morley 1903. Mediana—Dalla Torre and Kieffer 1910. Nervure mediane—Lacordaire 1834, André 1879. Medialnerv—Schmiedeknecht 1907. Vena externo-medialis—Dahlbom 1845. Externo-median vein—Cresson 1887. Externo-median nervure—Shuckard, Kirby. Nervure externo-mediane—de Romand. Deuxième nervure humerale—Wesmael. Nervus internus—Latreille. Nervure brachiale—Jurine. Nervus anterior—Haliday. Costa media—Mayr. Mittelrippe—Mayr. Première nervure intermédiaire—Lepeletier. Praebrachialis—Haliday. Praebrachial nervure—Marshall 1885. Nervus submedialis—Schenek. Cubitus—Thomson, Schmiedeknecht 1907 for Ichneumonidae and Braconidae. Nervus cubitalis—Thomson. Nervus radians—Dahlbom.

Synonyms of medius plus discoideus (part) plus subdiscoideus: Vēna media—Foerster 1877. Medius—Konow 1901, Enslin 1912. Medialaare—Nielsen and Henriksen 1915.

Discoideus.—Fig. 1, J¹TI¹PS; fig. 2, J¹I¹U¹; figs. 5, 6, 8, J¹I¹S; fig. 7, J¹P¹; fig. 9, GTI¹PS; fig. 10, F¹PS.

Usually the continuation of medius beyond the basal to the end of the first discoidal cell where it becomes transverse and extends to the posterior margin of the wing. Exceptions are found in figs. 7 and 9 which will be best understood by reference to these figures. This transverse portion has often been called a crossvein and has been named (2nd transverse median—Cameron 1882; Areal nerv—Konow 1901; etc.), while the basal section has been designated as nervure parallele by Wesmael and others. As used here the term was first restricted by Fernald 1906.

Synonyms of discoideus: Discoidal vein—Fernald 1906. Discoidal nervure—Cockerell and Robbins 1910. Discoidalis—Kieffer 1912.

Synonyms of first portion of discoideus: Nervure parallele—Wesmael. Nervus analis—Haliday. Nervure discoidale—de Romand. Discoidalmere—Zaddach. Subdiscoidal nervure—Shuckard.

Subdiscoideus.—Figs. 1, 2, 5, 8, PN¹P¹; figs. 6, 9, 10, PP¹.

The third apical longitudinal vein from metacarpus extending from the transverse section of discoideus towards the apical margin of the wing and forming the posterior boundary of the second and following discoidal cells, usually subparallel with cubitus. In fig. 7 the apical part of discoideus may be homologous with subdiscoideus, the transverse part of discoideus being wanting.

Synonyms: Subdiscoidal vein—Cresson 1887, Ashmead 1900, Fernald 1906. Subdiscoidal nervure—Shuckard. Subdiscoidal vein—Marlatt 1894. Discoidal vein—Norton 1867. Nervus parallelus—Ratzeburg 1848, Széligeti 1904, Schmiedeknecht 1907. Parallelnerv—Schmiedeknecht 1907. Parallelaer—Szépligeti 1904. Nervure parallele—Wesmael. Nervus posterior—André 1879. Vena discoidalis—Dahlbom 1845. Anal nervure—Marshall 1885, Morley 1903. Analis—Kieffer 1912. Nervus analis—Haliday. Medial cross-vein—MacGillivray 1906. Nervii spurii—Schmiedeknecht 1907 for second abscissa in Ichneumonidae. m—Fernald 1906. Vein m—Robertson 1903 b.

Basal.—Figs. 1, 2, 5, 6, 7, 8, JJ¹; fig. 9, BG; fig. 10, JF¹.

A transverse or oblique cross-vein at or about the middle of the wing, forming the apical boundary of the median cell and usually with its anterior end on subcosta (figs. 2, 5, 6, 7, 8, 9, 10) or rarely on cubitus (fig. 1), and always when present with its posterior end at end of medius.

Synonyms: Basal vein—Cameron 1882, Cresson 1887, Marlatt 1894, Ashmead 1900, Fernald 1906, Cockerell and Robbins 1910, Enslin 1912. Vena basal—Hartig, Foerster 1877. Basalis—Dalla Torre and Kieffer 1910, Kieffer 1912. Basalnerv—Schmiedeknecht 1907. Basalaare—Nielsen and Henriksen 1915. Nervure basale—Berthoumien 1904. Costa basalis—Mayr. Vena transverso-medialis—Dahlbom 1845. Discoidalnerv—Konow 1901, Enslin 1912. Discoidal nerve—Morice 1903. Discoidalaare—Nielsen and Henriksen 1915. Nervus margino-discoidalis—André 1879. Pobrachial transverse nervure—Marshall 1885. Medialquerader—Friese 1911. Nervus brachialis—Haliday. Grundader—Szépligeti 1904. Grundrippe—Mayr. Ast de Middelrippe—Mayr. m-cu—Comstock and Needham 1898, fig. 38. Vein a—Robertson 1902 b, 1903 b, 1903 c, 1904.

Recurrents.—Figs. 1, 2, 5, 6, 8, 9, 111 and (or) NN1.

Cross-vein or veins separating the discoidal cells, having their anterior end on cubitus and the posterior end of the first on discoideus and the posterior end of the second on subdiscoideus. In some groups the first recurrent curves outward and forms with the basal abscissa of cubitus, the discocubitus, q. v. (fig. 5, 1 K1).

Synonyms: Nervures recurrentes (or recurrent veins or nerves)—Jurine, Lepeletier, Say 1825, Wesmael, Schenck, Dahlbom, Hartig, Nees, Thomson, Haliday, André 1879, Ratzeburg 1848, Cameron 1882, Marshall 1885, Cresson 1887, Marlatt 1894, Ashmead 1900, Morley 1903, Berthoumieu 1904, Fernald 1906, Norton 1867, Cockerell and Robbins 1910. Nervus recurrens—Szépligeti 1904, Schmiedeknecht 1907. Nervures recurrentes-discoidalis—de Romand. Recurrente ordinaire—(second recurrent) Berthoumieu 1904. Venae transverso-discoidalis—Dahlbom 1845. Venulae transverso-discoidalis—Costa. Transverso-discoidalis—Kohl 1896, Szépligeti 1904, Kieffer

1912. Transverse discoidal nervures—Norton 1867. Interior discoidal nervure—(first recurrent) Marshall 1885. Discoidalqueruerr—Schmiedeknecht 1907. Discoidalquerader—Kohl 1896, Friese 1911. Medial nervs—Morice 1903. Medialnerv—Konow 1901, Enslin 1912. Anastomoses mediialae—Latreille. Tilbagelbeude aarer—Nielsen and Henriksen 1915. Rücklaufender—Szépligeti 1904, Schmiedeknecht 1907. Rücklaufendaern—Hartig. Rücklaufende—Enslin 1912. M_{3+4} —(First recurrent) Fernald 1906, Bradley 1908, MacGillivary 1906. M_2 —(second recurrent) Fernald 1906. Vein IV_3 —(first recurrent) Robertson 1902 a, 1902 b, 1904. Vein IV_2 —(second recurrent) Robertson 1902 a, 1903 b.

Discocubitus.—Fig. 5, I¹K¹.

The vein formed by the union of the first recurrent with cubitus when the first abscissa of cubitus is absent or obsolete, and extending usually in a curve from discoideus to the first intercubitus. This vein normally occurs in Ichneumonidae and rarely in other groups.

Synonyms: Disco-cubital—Ashmead 1900. Discocubitalader—Szépligeti 1905. Nervus discocubitalis—Schmiedeknecht 1907. Cubito-discoidal—Cresson 1887. Cubitus internal—Morley 1903.

Ramulus.—(Not illustrated.)

The stub of the first abscissa of cubitus projecting from the discocubital vein into the discocubital cell of certain Hymenoptera in which the basal portion of cubitus is effaced.

Synonyms: Ramulus—Morley 1903. Ramulus—Schmiedeknecht 1907. Nervus dividens—Ratzeburg 1848. Abbreviated cubital vein—Cresson 1887. Stump of a vein—Cresson 1887.

Submedius.—Fig. 1, UWT¹; figs. 2, 5, 6, 8, 9, 10, UT¹.

The second basal longitudinal vein which diverges from the anterior margin of the wing, originating at the base of the wing and forming the posterior boundary of the submedian cell, being subparallel with medius and terminating at nervulus. But very few authors have separated submedius from brachius.

Synonyms of submedius: 1stA+2dA+3dA—Fernald 1906. $1st+2d+3dA+Cu_2+1st+2d+3dA$ —Bradley 1908. 1stA—Comstock and Needham 1898, fig. 38.

Synonyms of submedius + brachius: Nervure sons-mediane—Lacordaire 1834. Submedian rein—Cresson 1887. Submedialis—Kieffer 1912. Submedialader—Kohl 1896. Brachium—Schmiedeknecht 1907. Brachius—Enslin 1912. Nervus brachialis—Thompson. Brachialuerr—Schmiedeknecht 1907. Brachialaare—Nielsen and Henriksen 1915. Nervure analede Romand. Anal nervure—Kirby, Shuckard. Vena analis—Dahlbom

1845. Nervus analis—Schenek, Dahlbom. Anal vein—Marlatt 1894. Fernald 1906. Analader—Friese 1911. Analnerv—Schmiedeknecht 1907. Vena postica—Hartig, Foerster 1877, Kohl 1896. Nervus posterior—Haliday. Hinterader—Foerster 1877. Pobrachialis—Haliday. Pobrachial nervure—Marshall 1885. Innenrippe—Mayr. Costa internomedia—Mayr. Seconde nervure intermediaire—Lepeletier. Troisieme nervure humerale—Wesmaol

Brachius.—Fig. 1, T^1U^1S ; fig. 2, $T^1W^1U^1$; figs. 5, 6, 8, 9, 10, T^1U^1 .

The continuation of submedius from nervulus to end of vein which is usually at or near the margin of the wing, and forming the posterior boundary of the first brachial cell. Apparently no writers have so divided submedius.

Synonyms: $M_{34,4} + Cu_{1+2} + 1stA + 2dA + 3dA$ —Fernald 1906.

Nervulus.—Figs. 1, 2, 9, 10, TT^1 ; figs. 5, 6, 7, 8, J^1T^1 .

The cross-vein connecting medius and submedius and forming the apical boundary of the submedian cell; in some Chalastogastra there is a more or less spurious cross-vein basad of nervulus which divides the submedian cell into two cells and which has been termed the prenervulus q. v.

Synonyms: Nervulus—Szépligeti 1904, Schmiedeknecht 1907, Kieffer 1912. Transverse median—Cresson 1887, Ashmead 1900, Fernald 1906. Transverso-medial nervure—Shuekard, Cockerell and Robbins 1910. Nervure transverso ordinaire—Tosquinet 1896, Berthoumieu 1904. First transverse median—Cameron 1882, Marlatt 1894. Nervus medio-discoidalis—André 1879. Vena transverso-submedialis 1°—Dahlbom 1845. Nervure medio-discoidale—André 1879. Vena transverso-humeralis—Foerster 1877. Nervus brachialis—Haliday. Nervus connectens—Dahlbom. Nervus transversus ordinarius—Thomson. Arealaare—Nielsen and Henriksen 1915. Erste areal nerv—Konow 1901. Erste arealquernerv—Enslin 1912. Areal nerve—Morice 1903. First inner apical nervure—Norton 1867. Pobrachial transverse-nervure—Marshall 1885. Innere Ast der Mittelrippe—Mayr. M4+Cu1—MacGillivray 1906. Bradley 1908. M4+Cu—Fernald 1906. Cu1—Comstock and Needham 1898, fig. 38, 48. Vein V2—Robertson 1903 b, 1903 c, 1904.

Prenervulus.—(Not illustrated.)

A more or less spurious cross-vein occurring in the submedian cell of some Chalastogastra, usually near its middle, which has its anterior end on medius and rarely is long enough to touch submedius.

Synonyms: Brachialnerr—Konow 1901. Brachialquernerr—Enslin 1912. Vena transcerso-subhumeralis—Föerster 1877. Cu₂—Comstock and Needham 1898, Robertson 1904.

Anal.—Fig. 1, UW1U1; fig. 2, WW1.

The third basal longitudinal vein which diverges from the anterior margin of the wing, originating either at the base of the wing or on submedius and joining submedius again beyond nervulus. Found only in some Chalastogastra. In some wings there is a free basal portion of the anal vein which is not connected to submedius and in such cases it can be assumed that the anal has coalesced medially with submedius and a portion of the base has become obsolete. In a selected series of sawfly wings it is possible to produce evidence that when the anal vein is absent it has united with submedius, but in other sawfly wings the evidence is quite otherwise and it would be more plausible to assume that the anal vein has been entirely lost.

Synonyms: Humerus—Thomson, Konow 1901, Morice 1903, Schmiedeknecht 1907. Enslin 1912. Nervus humeralis—Thomson. Humeralaare— Nielsen and Henriksen 1915. Vena accessoria—Foerster 1877. Nervus accessorius—André 1879. Accessory vein—Cameron 1882, Marlatt 1894. Begeitader—Foerster (teste André 1879). 3dA—Comstock and Needham 1898, fig. 38.

Interanal.—Fig. 1, WW1.

A cross-vein occurring in the anal cell of Chalastogastra, its anterior end on submedius and its posterior end on the anal vein. In some Braconidae represented by one, or in some cases two, stubs projecting from submedius into the anal area, fig. 6.

Synonyms: Transverse lanceolate vein—Marlatt 1894. Nervus transverso-lanceolée—André 1879. Vena transverso accessoria—Foerster 1877. Axillary transverse nervure—Marshall 1885. Humeralnerv—Konow 1901. Humeralquernerv—Enslin 1912. Cross-vein of the lanceolate cell—Norton 1867. Quernerv der lanzettforming Zelle—Enslin 1912. 2dA—Comstock and Needham 1898, fig. 38.

B. HIND WINGS WITH MANY VEINS.

Until comparatively recently systematists have paid but little attention to the veins and cells of the hind wing and in most cases they have given no key to their terminology. The few authors who have given keys to their terminology of the hind wing have attempted to analogize the veins and cells with those of the fore wing and have made it necessary to repeatedly use the phrase "of the hind wing" which unfortunately has in a number of cases been omitted leaving the reader in doubt. It is, with the hope of avoiding such uncertainty and the burdensome phrase "of the hind wing," that we have added the diminutives "ella" and "ellan" to the veins and cells, respectively, of the hind wing. In

using the same names (in a modified form) for the veins and cells of the hind wing as for those of the fore wing we have had in mind more the idea of conformity to previous nomenclature and the avoidance of the introduction of new terms than the tracing of analogies between the two wings. If analogy exists between the fore and hind wings it is not always traceable, at least with our present knowledge of wing morphology, and from a taxonomic standpoint is not of any great importance as the taxonomist is primarily concerned with a definite name for a definite thing.

Section I.—Cells.

Costellan Cell.—XI in all figures where it occurs.

The area between subcostella and costella or between subcostella and the anterior margin of wing.

Synonyms: Costal cell—Cameron 1882, Morley 1903. Fernald 1906. Costal arcolet—Marshall 1885. Cellule costale—Berthoumieu 1904. Costal-celle—Nielsen and Henriksen 1915. Arcola brachialis—André 1879. C—MacGillivray 1906. $C+Sc+Sc^1$ —Fernald 1906.

Radiellan Cell.—XII in all figures where it occurs.

The anterior apical cell bounded posteriorly by radiclla and anteriorly by stigmella and metacarpella or the anterior margin of wing. Occasionally in Braconidae (fig. 3)—divided by a cross-vein (interradiclla).

Synonyms: Radial cell—Ashmead 1900, Fernald 1906, Cameron 1882. Radial areolet—Marshall 1885. Cellule radiale—Berthoumieu 1904. Marginal cell—Ashmead 1900. Radialzelle—Enslin 1912. Radialcelle—Nielsen and Henriksen 1915. $R_1 + R_2$ —MacGillivray 1906, Fernald 1906.

Appendiculatellan cell.—Not illustrated.

The usually incomplete area formed between the anterior margin of wing and a spurious brauch or extension of radiella beyond the closed apical end of radiellan. Occurs rarely in Chalastogastra.

Synonyms: Appendicular cell—Cameron 1882. Anhangszelle—Enslin 1912.

Mediellan cell.—XIII, in all figures where it occurs.

The middle basal cell, bounded anteriorly by subcostella, posteriorly by mediclla and apically by basella (figs. 1, 2, 3, 4 and 6), or when basella is wanting it extends to intercubitella (figs. 5 and 8), and both radiclla and cubitella form part of its boundaries.

Synonyms: Median cell—Ashmead 1900, Morley 1903, Fernald 1906. First basal cell—Ashmead 1893. Cellule brachiale—Berthoumieu 1904. Praebrachial arcolet—Marshall 1885. Praebrachialzelle—Schmiedeknecht 1907. Arcola costalis—André 1879. M—MacGillivray—1906, Fernald 1906.

Cubitellan cell or cells.—XIV and supernumbers in all figures where it occurs.

The area between radiella and cubitella and bounded basally by basella, or, when basella is wanting (figs. 5, 11), by intercubitella. When basella is present the area may be divided by one or two cross-veins (intercubitellae) forming two or three cubitellan cells which are numbered from the base outward (figs. 1, 2, 3).

Synonyms: Cubital cell—Cameron 1882, Morley 1903, Fernald 1906. Cubital areolet—Marshall 1885. Cellule cubitale—Berthoumieu 1904. Ober Mittelzelle—Schmiedeknecht 1907, Enslin 1912. [Upper] Midteeller—Nielsen and Henriksen 1915. $R+R_5$ —(first cubitellan) MacGillivray 1906. R_4 —(second cubitellan) MacGillivray 1906. R_5 —(third cubitellan) MacGillivray 1906. $R+R_{3+4+5}$ —(in wasps) Fernald 1906.

Submediellan Cell.-XV in all figures where it occurs.

The area between mediella and submediella basad of nervellus.

Synonyms: Submedian cell—Ashmead 1900, Fernald 1906. Brachial-celle—Nielsen and Henriksen 1915. Pobrachialzelle—Schmiedeknecht 1907. Pobrachial arcolet—Marshall 1885. Basal cell—Morley 1903. First discoidal cell—Cameron 1882. M_3+Cu_1 —MacGillivray 1906. $M_3+Cu+Cu_1$ —Fernald 1906.

Discoidellan cell or cells.—XVI and supernumbers in figures where they occur.

The area between cubitella and discoidella. In some Chalasto-gastra it is divided by a cross-vein (recurrentella) forming two cells which are numbered from the base of the wing outward.

Synonyms: First discoidal cell—Morley 1903, Fernald 1906. Second discoidal cell—(First) Cameron 1882. First posterior cell—(Second) Cameron 1882. Cellule posterieure—Berthoumieu 1904. [Unterst] Mittelzelle—Schmiedeknecht 1907, Enslin 1912. [Lower] Midteeller—Nielsen and Henriksen 1915. M_4+1stM_2 —(first discoidellan) MacGillivray 1906. M_4 —(second discoidellan) MacGillivray 1906. $M_4+1stM_2+M_1$ —(wasps) Fernald 1906.

Anellan cell.—XVII in all figures where it occurs.

The area immediately behind submediella and brachiella and in all wings in which anella is wanting, bounded posteriorly by the hind margin of the wing: in those Chalastogastra in which anella is present it forms the posterior boundary of the cell. Occasionally divided by the interanella cross-vein (fig. 6). Synonyms: Anal cell—Morley 1903. Anal areolet—Marshall 1885. Areola analis—André 1879. Cellule anale—Berthoumieu 1904. Lanzett-förmige zelle—Enslin 1912. Lancetcelle—Nielsen and Henriksen 1915. Humeralfeld—Enslin 1912. Humeralcelle—Nielsen and Henriksen 1915. 1stA—MacGillivray 1906.

Brachiellan cell.—XVIII, in figures in which it occurs.

The area between discoidella and brachiella.

Synonyms: Second posterior cell—Cameron 1882. Second discoidal cell—Fernald 1906, Morley 1903. 2dM₂—MacGillivray 1906, Fernald 1906.

Postellan cell or cells.—Figs. 1, 2, XIX.

The area behind anella; usually divided by a longitudinal vein (axilius) forming two open cells.

Synonyms: Anal cell—Cameron 1882, 2dA—(first postellan) Mac-Gillivray 1906. 3dA—(second postellan) MacGillivray 1906.

Section II.—Veins.

Costella.—Fig. 1, 2, 8, 10, ab; fig. 9, ad.

The vein on the anterior margin of the wing between the wing base and the stigmella or before any veins branch from it.

Synonyms: Costa—Morice 1903, MacGillivray 1906, Fernald 1906, Enslin 1912. Costal vcin—Cameron 1882. Costal nervure—Marshall 1885. Costal-aare—Nielsen and Henriksen 1915. C—MacGillivray 1906, Fernald 1906.

Stigmella.—Fig. 2, bc.

The triangular, lanceolate or oval thickened portion of the vein on the anterior margin of the wing located at or near the middle; usually absent but occurring in some groups, often as a secondary sexual character.

Synonyms: Stigma—Ashmead 1900, and some other authors.

Metacarpella.—Figs. 1, 3, 5, 6, 8, bd; fig. 2, ch¹d.

The vein along anterior margin of wing beyond stigmella or if stigmella is wanting beyond costella.

Synonyms: Metacarpus—Marshall 1885. R₁—Fernald 1906.

Subcostella.—Figs. 1, 8, eb; fig. 2, ejb; fig. 3, abb, fig. 5, ab; figs. 6, 4, ajb.

The second, or when costella is wanting first, vein from the anterior margin of wing; extending from base to stigmella, or if stigmella is wanting then to the point where it joins the anterior margin of wing.

Synonyms—Subcosta—Morice 1903, Fernald 1906, Enslin 1912. Subcostal rein—Cameron 1882. Subcostal nervure—Marshall 1885. Subcostalaare—Nielsen and Henriksen 1915. Cubitalnerv—Schmiedeknecht 1907. Anterior rein—Morley 1903. R+M—Fernald 1906.

Radiella.—Fig. 1, hkd; fig. 2, hkh¹; fig. 3, hkq¹h¹; fig. 5, hkh¹; figs. 6, 4, hh¹; fig. 8, hk.

The apical longitudinal vein which originates near the middle of the anterior margin of the wing and extends to near the apex. In the apical portion of the wing it is the first vein from the anterior margin.

Synonyms: Radius—Marshall 1885, Morice 1903, Fernald 1906, Schmiedeknecht 1907, Enslin 1912. Radial vein—Morley 1903. Nervus radialis— André 1879. Radialaare—Nielsen and Henriksen 1915. Abscissula (in Ichneumonidae)—Schmiedeknecht 1907. Rs+M—MacGillivray 1906.

Mediella.—Figs. 1, 2, 3, 6, 7, fj¹; figs. 5, 8, fg; fig. 4, ftg.

That portion of the third, or second when costella is wanting, longitudinal vein from the anterior margin of the wing basad of basella or, if basella is wanting (figs. 5, 8), basad of origin of cubitella.

Synonyms: Median vein—Ashmead 1900, Fernald 1906. Middle vein—Ashmead 1900. Mittelader—Szépligeti 1905. Medialaare—Nielsen and Henriksen 1915. Praebrachial nervure—Marshall 1885. Brachialnerv—Schmiedeknecht 1907. Cu—MacGillivray 1906, Fernald 1906.

Cubitella.—Figs. 1, 2, gik¹g¹; fig. 3, j¹k¹g¹; fig. 5, gk¹g¹; figs. 6, 4, gg¹; fig. 8, gk¹.

The second (from anterior margin) longitudinal vein in the apical part of the wing, originating either at the basal or from mediella in close proximity to nervellus.

Synonyms: Cubitus—Marshall 1885, Ashmead 1898, etc., Morice 1903, Fernald 1906, Enslin. Cubitalaare—Nielsen and Henriksen 1915.

Intercubitella.—Figs, 1, 2, 3, 5, 8, kk1.

A cross-vein between radiella and cubitella. In most wings there is only one intercubitella but in certain Chalastogastra two or three are present.

Synonyms: Transverse cubital—Cameron 1882. Cubital nerves—Morice 1903. Cubitalquernerven—Enslin 1912. Nervus recurrens—Schmiede-knecht 1907 (Ichneumonidae). Nervus transverso-discoidalis—André 1879. Fifth branch of radius—(first intercubitella) MacGillivray 1906. Fourth branch of radius—(second intercubitella) MacGillivray 1906. Ro-tfirst

intercubitella) MacGillivray 1906. R_4 (second)—MacGillivray 1906. M_4 —Fernald 1906.

Interradiella.—Fig. 3, bq1.

A cross-vein between radiella and metacarpella. Rarely present.

Synonym: Transverse nervure of marginal cell-Ashmead 1900.

Basella.—Fig. 1, hgj¹; fig. 2, jhgj¹; fig. 3, hj¹; fig. 6, jgj¹; fig. 7, jj¹; fig. 4, jg.

A cross-vein situated at about the anterior middle of the wing, having its origin from subcosta or stigmella and terminating at mediella. Present in Chalastogastra, Braconidae and a few other groups. When the cross-vein is well towards apex of wings as in figs. 5 and 8 it is considered to be intercubitella. It is not likely that basella (jgj¹, fig. 6) is homologous with intercubitella (kk¹, fig. 5).

Synonyms: Basal nervure—Ashmead 1900, Enslin 1912. Discoidal nerve—Morice 1903. Discoidalnerv—Enslin 1912. Praebrachial transverse nervure—Marshall 1885.

Submediella.—Figs. 1, 3, 5, 4, 8, ut^1 ; fig. 2, uw^1t^1 ; fig. 6, umt^1 .

The portion of the fourth (or third when costella is wanting) longitudinal vein from the anterior margin of the wing basad of nervellus.

Synonyms: Brachius—Enslin 1912. Brachium—Schmiedeknecht 1907 (Ichneumonidae). Brachialaare—Nielsen and Henriksen 1915. Pobrachial nervure—Marshall 1885. Posterior rein—Morley 1903. $M_4+Cu_{1+2}+1stA$ —Fernald 1906.

Discoidella.—Figs. 1, 2, j¹ts; fig. 5, ts; fig. 8, gs.

The third apical longitudinal vein from the anterior margin of the wing; often absent (figs. 3, 4, 6, 9, 11), but when present, either forming a continuation of mediella from basella to the wing margin (figs. 1, 2), or in the absence of basella beginning at nervellus (fig. 8), or, in some instances, originating at a point on nervellus (fig. 5).

Synonyms: Discoidal vein—Fernald 1906. Subdiscoidal nervure—Ashmead 1900. Medial cross-vein—MacGillivray 1906. Nervellus—Morley 1903. $m+M_2$ —Fernald 1906.

 $\textbf{Nervellus.} - Figs.~1, 2, 3, 4, ~tt^1; ~figs.~6, 7, ~j^1t^1; ~fig.~8, ~gt^1; ~fig.~5, ~gtt^1.$

A transverse, oblique or broken cross-vein connecting mediella and submediella, or in some wings (figs. 1, 2) connecting discoid-

ella and submediella and forming the apical boundary of the submediellan cell. This term is now in general use especially by Ichneumonologists.

Synonyms: Nervellus—Schmiedeknecht 1907. Areal nervure—Morice 1903. Arealquernerv—Enslin 1912. Transverse median—Cameron 1882, Ashmead 1900, Fernald 1906. First transverse median vein—Marlatt 1894. Humeral crossnervure—Davis 1897. Transverse discoidal—Cameron 1882. Transverse-humeralis—Kohl 1896. First recurrent—Morley 1903. Pobrachial nervure—Marshall 1885. Nervure transversale anale—Berthoumieu 1904. Tilbagelbeude aarer—Nielsen and Henriksen 1915. Submedialquerader—Kohl 1896. Nervus medio-discoidalis—André 1879. M₃—MacGillivray 1906, Fernald 1906.

Brachiella.—Figs. 2, 3, 4, 5, 6, 8, t¹u¹.

Submediella beyond nervellus.

Synonyms: $M_{3+4}+Cu_{1+2}+1stA+2dA$ —Fernald 1906.

Anella.—Figs. 1, uu¹; 2, uw¹.

The fifth (or fourth when costella is wanting) longitudinal vein from the anterior margin of the wing, originating at the base of wing and usually joining with submediella apically. Usually developed in Chalastogastra, rarely in Clistogastra.

Synonyms: Second anal vein—MacGillivray 1906. Humeras—Morice 1903, Enslin 1912. Humeralaare—Nielsen and Henriksen 1915. Accessory—Cameron 1882. Axillary—Fernald 1906. 2dA—MacGillivray 1906.

Axillus.—Figs. 1, 2, un.

The sixth (or fifth when costella is wanting) basal longitudinal vein, usually nearly parallel with the basal part of the hind margin of the wing and present only in Chalastogastra.

Synonyms: Axillus—Konow 1901, Morice 1903, Enslin 1912. Axillary vein—Marlatt 1894. Nervus axillaris—André 1879. Axillaraare—Nielsen and Henriksen 1915. Third anal vein—MacGillivray 1906. 3dA—MacGillivray 1906, Fernald 1906.

Recurrentella.—Figs. 1, 2, ii¹.

The cross-vein connecting cubitella and discoidella; usually present in Chalastogastra but wanting in Clistogastra.

Synonyms: Recurrent vein—Cameron 1882. Medial nerves—Morice 1903. Medialnerven—Enslin 1912. Rücklaufende nerv—Enslin 1912.

Interanella.—Fig. 6, mm¹.

A cross-vein originating from submediella and dividing the anellan cell in some Braconidae.

Synonym: Anal nervare-Marshall 1885.

Postnervellus.—Fig. 4, gz.

A cross-vein extending from mediella or cubitella towards the posterior margin of the wing in certain Braconidae.

Synonym: Postnervellus-Gahan 1915.

C. THE WINGS WITH FEW VEINS.

In the Chalcidoidea and certain other groups the venation is so greatly reduced as to cause systematists to use a different terminology. To explain this terminology, which is certainly most convenient to the systematist, it is desirable to consider these wings separately. Under the term "nervure sous costale" André 1879 classifies the entire normal Chalcidid venation, but he also explains and synonymizes the terms for the various parts used. However, the terminology proposed by Howard in 1881 has been more generally used by systematists and is adopted here.

Submarginal.—Fig. 11, AB.

The basal portion of the longitudinal vein posterior to the anterior margin of the wing in Hymenoptera in which the venation is reduced to one longitudinal vein. This vein occupies the same position as the subcosta of the more generalized wings and is perhaps homologous with it.

Synonyms: Submarginal vein—Howard 1881, Cresson 1887, Ashmead 1904. Nervus subcostalis—Ratzeburg 1848. Humerus—Haliday. Abscissa humeralis—Foerster 1877. Ramus humeralis—Foerster 1856. Rameau humeral—André 1879. Schulterstruck—André 1879. Schulterstruck—1879.

Marginal.—Fig. 11, BC.

That portion of the longitudinal vein which lies along the anterior margin of the wing, basad of the branch (stigmal) which extends obliquely into the body of the wing from the anterior margin in the Hymenoptera in which the venation is reduced to a longitudinal vein. This vein occupies the same position as the stigma in the more generalized wings and is perhaps homologous with it.

Synonyms: Marginal vein—Howard 1881, Cresson 1887, Ashmead 1904. Ramus marginalis—Foerster 1856. Rameau marginal—André 1879. Abscissa marginalis—Foerster 1877. Marginalnerv—Schmiedeknecht 1907. Nervus duplex—Ratzeburg 1848. Ulma—Haliday. Randast—André 1879.

Postmarginal.—Fig. 11, CD.

That portion of the longitudinal vein which lies along the anterior margin of the wing beyond the branch vein (stigmal) in

Hymenoptera in which the venation is reduced to one longitudinal vein. This vein occupies the same position as the metacarpus of the more generalized wing and is perhaps homologous with it.

Synonyms: Postmarginal rein—Howard 1881, Cresson 1887, Ashmead 1904. Ramus post-marginalis—Foerster 1856. Raman postmarginal—André 1879. Postmarginalnerr—Schmiedeknecht 1907. Abscissa postmarginalis—Foerster 1877. Radius—Haliday. Nerrus costa.—Ratzeburg 1848. Hinterandust—André, 1879.

Stigmal.—Fig. 11, CH.

A stump of a vein which projects more or less obliquely from the anterior margin into the body of the wing in Hymenoptera which have the venation reduced to one longitudinal vein. This vein occupies the position of the radius of the more generalized wing and is perhaps homologous with it.

Synonyms: Stigmal rein—Howard 1881, Cresson 1887, Ashmead 1904. Ramus stigmaticus—Foerster 1856. Ramulus stigmaticus—Nees. Rameau stigmatical—André 1879. Nervus radialis—Ratzeburg 1848. Radius—Schmiedeknecht 1907. Abscissa radialis—Foerster 1877. Subcosta—Schmiedeknecht 1907. Cubitus—Haliday. Zweig—André 1879.

Submarginella.—Fig. 11, ab.

The portion of the longitudinal vein in the hind wing lying posterior to the anterior margin of the wing.

Marginella.-Fig. 11, bc.

The portion of the longitudinal vein in the hind wing lying on the anterior margin.

ALPHABETICAL LIST OF SYNONYMS.

EXPLANATORY NOTE.

Throughout this list the words "first," "cell," "area," "cellule," "nervus," "erste," "vena," etc., when used as a part of any cell or vein have either been dropped or placed after the name of the vein or cell, e.g., First recurrent will be found under Recurrent [1st] etc. It has been found advisable to make a separate list (see p. 62) of synonyms for those systems which make extensive use of symbols.

Abbreviated cubital vein—Cresson 1887 = ramulus.

Abscissa humeralis - Foerster 1877 = submarginal.

Abscissa marginalis | Foerster 1877 = marginal.

Abscissa postmarginalis—Foerster 1877 = postmarginal.

Abscissa radialis—Foerster 1877 = stigmal.

Abscissula - Schmiedeknecht 1907 (Ichneumonid) = radiella.

Accessoria, ire, ius, y [nervure, nervus, vein]—André 1879, Cameron 1882, Foerster 1877, Marlatt 1894 = anal vein.

Acessory vein—Cameron 1882 = anella

Analader—Friese 1911 = submedius + brachius.

Anal, e, is [area, areola, cell or cellule]—Berthoumieu 1904, Costa, Cockerell and Robbins 1910, Cresson 1887, Fernald 1906, Kirby, Lacordaire 1834, de Romand, Shuckard = anal cell.

Anal, e [areolet, cell, cellule]—Berthoumieu 1904, Marshall 1885, Morley 1903 = anellan.

Anal, is, e [areola, cell, cellule]—André 1879, Cameron 1882, Marlatt 1894 = posterior.

Anal, is, e [areola, cell, cellule]—André 1879, Cameron 1882, Marlatt 1894 = postellan.

Anale [cellule]—Haliday, Wesmael = 2d brachial cell.

Anal, e [cell, cellule]—Haliday, Marshall 1885, Morley 1903, Wesmael = 2d brachial.

Analfeld—Konow $1901 = 2d \ brachial + posterior$.

Anal, e, is [nervure, nervus, vein]—André 1879, Dahlbom, Cameron 1882, Cockerell and Robbins 1910, Cresson 1887, Fernald 1906, Kirby, Marlatt 1894, Norton 1867, de Romand, Schmiedeknecht 1907, Shuckard = submedius + brachius.

Anal, is [nervus]—Haliday, Morice 1903 = basal section of discoideus.

Anal, is [nervus]—Haliday, Marshall 1885, Morley 1903 = subdiscoideus.

Anal nervure—Marshall 1885 = anella.

Anal, e, is [nervure, nervus, vein]—André 1879, Berthoumieu 1904, Cameron 1882, Fernald 1906 = submediella + brachiella.

Anal vein [2d]—MacGillivray 1906 = interanal.

Anal vein [2d]—MacGillivray 1906 = anella.

Anal vein [3d]—MacGillivray 1906 = basal part of anal vein.

Anal vein [3d]—MacGillivray 1906 = axillus.

Analis—Kieffer 1912 = subdiscoidcus.

Analzelle—Konow 1901 = 1st brachial.

Analzelle-Szépligeti 1904 = anal cell.

Anastomoses medii alae—Latreille = recurrents.

Anhangszelle—Enslin 1912, Kohl 1896, Konow 1901 = appendiculate cell.

Anhangszelle—Enslin 1912 = appendiculatellan.

Anterior vein - Morley 1903 = subcostella.

Anterior nervus—Haliday = medius + base of diseoideus.

Apical areola—Kirby = 4th cubital or 2nd brachial.

Apical cell—Morley 1903 = radial.

Apical cell [1st]—Cresson 1887, Fernald 1906, Shuckard = 2d brachial.

Apical cell [2d]—Cresson 1887, Fernald 1906, Shuckard = 3d discoidal.

Apicale [cellule]—de Romand = 2d brachial.

Appendice de la radiale—André 1879 = appendiculate voin.

Appendicular, ate, icea, icée [areola, cell, cellula, cellule]—André 1879, Cameron 1882, Costa, Foerster 1877, Hartig, Marlatt 1894 = appendiculate cell.

Appendicular cell—Cameron 1882 = appendiculatellan.

Apterostigma—Wheeler 1910 = stigma.

Arealaare—Nielsen and Henriksen 1915 = nervulus.

Areal nerve—Morice 1903 = nervulus.

Areal nerve—Morice 1903 = nervellus.

Arealnery—Konow 1901 = nervellus.

Arealnery [1st]—Konow 1901 = nervulus.

Arealnerv [2d]—Konow 1901 = transverse part of discoideus,

Arealquernerv—Enslin 1912 = nervellus.

Arealquernery [1st]—Enslin 1912 = nervulus.

Arealquernerv [2d]—Enslin 1912 = transverse part of discoideus.

Areola, e. et—Ashmead 1900, Berthoumieu 1904, Cresson 1887, Gravenhorst, Dalla and Kieffer 1910, Schmiedeknecht 1907, Szépligeti 1904, Tosquinet 1896 = areolet.

Areola exterior—Haliday = 2d discoidal.

Ast de Mittelrippe—Mayr = basal.

Aussere Ast der Cubitalrippe—Mayr = cubitus.

Ausser Hinterzelle—Zaddach = 2d brachial.

Ausser Mittelzelle-Mayr = median.

Auxiliaris [nervus]—Dahlbom, Fallén, Schenck = subcosta.

Axillaraare—Nielsen and Henriksen 1915 = axillus.

Axillary areolet—Marshall 1885 = anal cell.

Axillary, aris, ius [nervure, nervus, vein]—André 1879, Enslin 1912, Konow 1901, Marlatt 1894, Morice 1903 = axillus.

Axillary [vein]—Fernald 1906 = anella.

Axillary transverse nervure—Marshall 1885 = 1st interanal.

Basal cell—Ashmead 1900 = medicllan.

Basal cell—Morley 1903 = submediellan.

Basal cell [1st]—Morley 1903 = median,

Basal cell [1st]—Ashmead 1893 = mediellan.

Basal cell [2d]—Ashmead 1893, Morley 1903 = submedian.

Basal cell [3d]—Morley 1903 = anal cell.

Basal, e [nervure, nervus, vein]—Ashmead 1900, Berthoumieu 1904, Cameron 1882, Coekerell and Robbins 1910, Cresson 1887, Enslin 1912, Fernald 1906, Foerster 1877, Hartig, Marlatt 1894, Thomson = basal.

Basal [nervure, vein]—Ashmead 1900, Enslin 1912 = basella.

Basal vein—Morley 1903 = basal + nervulus.

Basalaare—Nielsen and Henriksen 1915 = basal.

Basalader—Kohl 1896 = basal + nervulus.

Basalis—Dalla Torre and Kieffer 1910, Kieffer 1912 = basal.

Basalnerv—Schmiedeknecht 1907 = basal.

Basis radii — Schmiedeknecht = 1st abscissa of radius.

Begeitader-Foerster 1877 = anal vein.

Brachial cell [1st]—Norton 1867 = median.

Brachial cell [2d]—Norton 1867 = submedian.

Brachialaare—Nielsen and Henriksen 1915 = submedius + brachius.

Brachialaare—Nielsen and Henriksen 1915 = submediella.

Brachialcelle—Nielsen and Henriksen 1915 = submedian.

Brachialcelle—Nielsen and Henriksen 1915 = submediellan.

Brachiale, is [areola, cellule]—André 1879, Lepeletier 1825 = costal.

Brachiale, is [areola, cellule]—André 1879 = costellan.

Brachiale cellule [1st]—Lepetelier 1836 = costal.

Brachiale cellule [2d]—Lepetelier 1836 = median.

Brachiale cellule [3d]—Lepetelier 1836 = submedian.

Brachiale cellule [4th]—Lepetelier 1836 = anal cell.

Brachiale cellule—Berthoumieu 1904 = 1st brachial.

Brachialfeld—Konow 1901 = submedian.

Brachiale cellule—Berthoumieu 1904 = mediellan.

Brachialis, areola [anterior]—Nees = median.

Brachialis, cellule [2nd]—Thomson = 1st brachial.

Brachial nervures—Say 1825 = all longitudinal veins behind subcosta and cubitus but usually used for medius + discoideus + subdiscoideus.

Brachialnerv—Schmiedeknecht 1907 = submedius + brachius.

Brachialnerv—Konow 1901 = prenervulus.

Brachialnerv—Schmiedeknecht 1907 = mediella discoidella.

Brachialquernerv—Enslin 1912 = prenervulus.

Brachialzelle—Schmiedeknecht 1907, Szépligeti 1905 = 1st brachial.

Brachiale [nervure]—Jurine = medius + base of discoideus.

Brachialis [nervus]—Haliday = basal + nervulus.

Brachius, um [nervure]—Berthoumieu 1904, Enslin 1912, Konow 1901. Morice 1903, Schmiedeknecht 1907, Thomson = submedius + brachius.

Brachius, um—Enslin 1912, Morice 1903, Schmiedeknecht 1907 = sahmediella + brachiella.

Brachium [nervure]—Berthoumieu 1904 = mediella + eubitella.

Carpe, us—Foerster 1877, Lacordaire 1834, Say 1825, Zaddach = stigma. Cell—See explanatory note.

Cellula-See explanatory note.

Cellule—See explanatory note.

Cellule du disque—Saussure 1852 = 1st + 2d discoidal + 1st brachial.

Cellule du limbe [1st]—Saussure 1852 = 3d discoidal.

Cellule du limbe [2d]—Saussure 1852 = 2d brachial.

Connectens [nervus]—Dahlbom = nervulus or rarely intercubiti.

Costa, lis—Fernald 1906, MacGillivray 1906, Marshall 1885, Kieffer 1912 = costa.

Costa, 1, lis [nervure, nervus, vena] – André 1879, Berthoumieu 1904.
Cameron 1882, Cockerell and Robbins 1910, Cresson 1887, Dahlbom,
Enslin 1912, Fallén, Fernald 1906, Haliday, Kirby, Konow 1901, Lacordaire 1834, Latreille, Marlatt 1894, Morice 1903, Norton 1867, Say 1825, Schenck, Schmiedeknecht 1907, Shuckard, Thomson = costa + metacarpus.

Costa, I, is [nervure, nervus]—André 1879, Cameron 1882, Enslin 1912, Fernald 1906, MacGillivray 1906, Marshall 1885, Morice 1903 = costella.

Costa Basalis—Mayr = basal.

Costa Marginalis—Mayr = costa + metaearpus.

Costa Media—Mayr = $medius + basal\ section\ of\ discoideus$.

Costa Internomedia—Mayr = submedius + brachius.

Costal Scapularis—Mayr = subcosta.

Costal [nervus]—Ratzeburg 1848 = postmarginal.

Gostal, e, is [area, areolet, cell, cellula, cellule]—Cameron 1882, Cockerell and Robbins 1910, Cresson 1887, Dahlbom, Fernald 1906, Haliday, Kirby, Lacordaire 1834, Marlatt 1894, Norton 1867, de Romand, Shuckard, Thomson = costal.

Costal, e [areolet, cell, cellule]—Berthoumieu 1904, Cameron 1882, Fernald 1906, Marshall 1885, Morley 1903 = costellan.

Costal [area]—Kirby = radial $\epsilon ells$.

Costal, e, is [area, areola, cellule]—André 1879, Berthoumieu 1904, Fallén = median.

Costal, e, is [areola, cellule]—André 1879 = mediellan.

Costalaare—Nielsen and Henriksen 1915 = costa.

Costalaare—Nielsen and Henriksen 1915 = eostella.

Costalader—Szépligeti 1905 = costa.

Costalcelle—Neilsen and Henriksen 1915 = costal.

Costalcelle - Nielsen and Henriksen 1915 = costellan.

Costalzelle—Kieffer 1912, Schmiedeknecht 1907 = costal.

Cross-vein of lanceolate cell—Norton 1867 = interanal.

Cubit, al, ale, alis, us [nervure, nervus, vein, vena]—André 1879, Cameron 1882, Cockerell and Robbins 1910, Cresson 1887, Dahlbom, Dalla Torre and Kieffer 1910, Enslin 1912, Fernald 1906, Foerster 1877, Haliday, Hartig, Kieffer 1912, Konow 1901, Lacordaire 1834, Lepeletier, Marlatt 1894, Marshall 1885, Morice 1903, Ratzeburg 1848, de Romand, Shuckard, Sichel, Wesmael, Zaddach = cubitus.

Cubital, e, is [area, areola, areolet, cell, cellula, cellule]—André 1879, Berthoumieu 1904, Cameron 1882, Costa, Dalla Torre and Kieffer 1910, Fernald 1906, Foerster 1877, Jurine, Lacordaire 1834, Lepeletier, Marlatt 1894, Marshall 1885, Morley 1903, Norton 1867, de Romand, Saussure 1852, Say 1825, Shuckard, Sichel, Wesmael = cubital cells.

Cubital, e, is [areolet, cell, cellule]—Berthoumieu 1904, Cameron 1882, Fernald 1906, Marshall 1885, Morley 1903 = cubitellan.

Cubital cell [1st]—Morley 1903 = discocubital.

Cubital (external)—Morley 1903 = 3d abscissa of cubitus.

Cubital (internal)—Morley 1903 = discocubitus.

Cubital nerves—Morice 1903 = intercubiti.

Cubital nerves—Morice 1903 = intercubitellac.

Cubital vein—Cameron 1882 = mediella + discoidella.

Cubitalaare—Nielsen and Henriksen 1915 = cubitus.

Cubitalaare - Nielsen and Henriksen 1915 = cubitella.

Cubitalcelle—Nielsen and Henriksen 1915 = cubital.

Cubitalfeld—Konow 1901 = cubital.

Cubitalis interna [cellula]—Gravenhorst = 1st cubital.

Cubitalnery—Schmiedeknecht 1907 = subcostella.

Cubitalquerader—Friese 1911, Kohl 1896, Szépligeti 1904 = intercubiti.

Cubitalquernerv—Enslin 1912, Konow 1901, Schmiedeknecht 1907 = intercubiti.

Cubitalquernerv—Enslin 1912 = intercubitella.

Cubitalrippe—Mayr = cubitus.

Cubitalscheidnerv—Zaddach = intercubiti.

Cubitalvaeraare—Nielsen and Henriksen 1915 = intercubiti.

Gubitalzelle—Dalla Torre 1910, Enslin 1912, Friese 1911, Hartig, Kieffer 1912, Kohl 1896, Mayr, Ratzeburg 1848, Schmiedeknecht 1907, Szépligeti 1904, Zaddach = cubital.

Cubito-discoidal—Cresson 1887 = discocubitus.

Gubitus—Enslin 1912, Fernald 1906, Marshall 1885, Moriee 1903 = cubitella.

Cubitus—Berthoumieu 1904, Schmiedeknecht 1907, Thomson = medius + base of discoidcus.

Cubitus—Haliday = stigmal.

Cubitus—Hartig, Jurine, Saussure, Say 1825 = subcosta.

Cubitus—Berthoumieu 1904 = subcostella + radiella.

Cubitus inférieure—Lepeletier 1836 = cubitus.

Cubitus superieur—Lepeletier = subcosta.

Deuxieme—See explanatory note.

Deuxieme cellule du limbe—Lepeletier = 2d brachial.

Discal cell, 1st—Marlatt 1894 = 1st discoidal.

Discal cell, 2d—Marlatt 1896 = 2d discoidal.

Discal cell, 3d—Marlatt 1894 = 1st brachial.

Discocubital, is [cell, cellula]—Ashmend 1900, Schmiedeknecht 1907 = discocubital cell.

Discocubital, is [nervures, nervus]—Ashmead 1900, Schmiedeknecht 1907 = discocubitus.

Discocubitalader—Szépligeti 1905 = discocubitus.

Discocubitalzelle—Szépligeti 1905 = discocubital cell.

Discoidal cell—Smith = 1st discoidal.

Discoidal cell—Ashmead 1900, Berthoumieu 1904, Thomson = 2d discoidal.

Discoidal, e, is [areola, cell, cellula, cellule] 1st—André 1879, Ashmead 1900, Cameron 1882, Cockerell and Robbins 1910, Costa, Cresson 1887, Fernald 1906, Foerster 1877, Lepeletier, Norton 1867, Ratzeburg 1848, Shuckard = 1st discoidal.

Discoidal [cell]—Morley 1903 = 2d discoidal.

Discoidal [cell] 1st—Fernald 1906, Morley 1903 = discoidellan.

Discoidal [cell] 1st—Cameron 1882 = submediellan.

Discoidale [cellule] 2d de Romand = 1st discoidal.

Discoidal, e, is |areola, cell, cellula, cellule| 2d --André 1879, Banks 1912, Cameron 1882, Costa, Foerster 1887, Norton 1867 = 2d discoidal.

Discoidal, e, is [areola, cell, cellula, cellule] 2d—Ashmead 1900, Cockerell and Robbins 1910, Cresson 1887, Fernald 1906, Lepeletier 1836, Morley 1903, Ratzeburg 1848 = 1st brachial.

Discoidal [cell] 2d—Cameron 1882 = 1st discoidellan.

Discoidal [cell] 2d—Fernald 1906, Morley 1903 = brachiellan.

Discoidal, e, is [areola, cell, cellule] 3d—Cockerell and Robbins 1910, Cresson 1887, Fernald 1906, Lepeletier 1836, de Romand, Shuekard = 2d discoidal.

Discoidal, e, is [areola, cell, cellula, cellule] 3d—Dahlbom, Foerster 1877, Morley 1903, Norton 1867, Sichel = 3d discoidal.

Discoidale, is [cellula, cellule] 3d—Costa, André 1879 = 1st brachial.

Discoidale [cellule] 4th —de Romand = 3d discoidal.

Discoidalis externa [cellula]—Gravenhorst = 2d brachial.

Discoidalis intermedia [cellula]—Gravenhorst = 2d discoidal.

Discoidale inferieure [cellule]—Lepeletier 1825, Wesmael = 2d discoidal.

Discoidalis interior [cellula]—Gravenhorst = 1st discoidal.

Discoidale interne [cellule]—Wesmael = 1st brachial.

Discoidale superieure [cellule] 2d—Lepeletier 1825 = 1st brachial.

Discoidale superieure externa [cellule]—Wesmael = 1st discoidal.

Discoidal, is [nervure]—Cockerell and Robbins 1910, Fernald 1906, Kieffer 1912 = discoideus.

Discoidal nerve—Morice 1903 = basal.

Discoidal nerve—Morice 1903 = basella.

Discoidal—Fernald 1906 = discoidella.

Discoidal vein—Norton 1867 = subdiscoideus.

Discoidal nervure—Ashmead 1900 = transverse part of discoidens.

Discoidalis [nervus]—André 1879 (text) = basal section of discoideus.

Discoidalaare - Nielsen and Henriksen 1915 = basal.

Discoidalceller [1-2-3]—Nielsen and Henriksen 1915 = 1st, 2d, 3d discoidal.

Discoidalnery—Enslin 1912, Konow 1901 = basal.

Discoidalnery—Enslin 1912 = basella.

Discoidalnery—Zaddach = first section of discoideus.

Discodialquerader—Friese 1911, Kohl 1896 = recurrents.

Discoidalquernery Schmiedeknecht 1907 = recurrents.

Discoidalzelle—Enslin 1912, Konow 1901, Kieffer 1912, Mayr = 1st discoidal.

Discoidalzelle - Szépligeti 1905 = 2d discoidal.

Discoidalzelle [1st] - Zaddach = 1st discoidal.

Discoidalzelle [2d]—Szépligeti 1904 = 1st brachial.

Discoidalzelle $|2\mathbf{d}|$ – Zaddach = 2d discoidal.

Discoidalzelle [3d] —Zaddach = 1st brachial.

Discoidalzelle [hinter]—Kieffer 1912 = 1st brachial.

Dividens [nervus] Ratzeburg 1848 = ramutus.

Discoidalzellen [1st, 2d, 3d] - Friese 1911, Kohl 1896, Schmiedeknecht 1907 = discoidal vells-1-2/3.

Distale Submedianzelle-Kieffer 1912 = 1st brachial.

Du disque [cellule]—Saussure 1952 = 1st + 2d discoidal + 1st brachial.

Du limbe [2d cellule]—Lepeletier = 2d brachial.

Du limbe [cellule]—Saussure 1852 = 3d discoidal + 2d brachial.

Duplex [nervus]—Ratzeburg 1848 = marginal.

Erste-See explanatory note.

Externa [cellule]—Gravenhorst = 3d cubital.

Externa media [areola]—Haliday = 3d discoidal.

Externo-median, 1 [cell]—Cresson 1887, Shuckard = median cell.

Externo medial [vein]—Cockerell and Robbins 1915 = medius.

Externo-median, e [nervure or vein]—Cresson 1887, Kirby, Norton 1867, de Romand, Shuckard = medius + 1st section of discoideus.

Fifth—See explanatory note.

First—See explanatory note.

Flügemal—Kohl 1896 = stigma.

Fourth -See explanatory note.

Furcata [cellula]—Thomson = 1st discoidal.

Grundader-Szépligeti 1904, 1905 = basal.

Grundrippe—Mayr = basal.

Hinterader -Foerster 1877 = submedius + brackius.

Hintere-mittlere Schulterzelle—Szépligeti 1904 = 1st brachial.

Hintere Discoidalzelle - Kieffer 1912 = 1st brachial.

Hintere Schulterzelle—Szépligeti 1904 = anal cell.

Hinterrandast—André 1879 = postmarginal.

Hinterzelle [1st]—Zaddach = 3d discoidal.

Humeral cell—Cameron 1882 = median.

Humeral, e [cell, cellule] 1st—Ratzeburg 1848, Wesmael = median.

Humeral, e [cell, cellule] 2d—Ratzeburg 1848, Wesmael = submedian.

Humerale [cellule] 3d.—Wesmael = anal cell.

Humer, ale, alis, us [nervus, vein]—Enslin 1912, Konow 1901, Morice 1903, Schmiedeknecht 1907, Thomson = anal rein.

Humeralaare—Nielsen and Henriksen 1915 = anal vein.

Humeralaare—Nielsen and Henriksen 1915 = anella.

Humeralcelle Nielsen and Henriksen 1915 = anal cell.

Humeralcelle—Nielsen and Henriksen 1915 = anellan.

Humeral cross-vein—Davis 1897 = nervellus.

Humeralfeld-Enslin 1912, Konow 1901 = anal cell.

Humeralfeld—Enslin 1910 = anellan.

Humerale [nervure] 1st—Wesmael = costa or subcosta.

Humerale [nervure] 2d—Wesmael = medius + base of discoidens.

Humerale [nervure] 3d | Wesmael = submedius + brachius.

Humeralis antice [area]—Foerster 1877 = median.

Humeralis externa [cellula] Gravenhorst = median.

Humeralis intermedia [cellula]—Gravenhorst = submedian.

Humeralis interna [cellula]—Gravenhorst = anal cell.

Humeralis lanceolata [area]—Foerster 1877 = anal cell.

Humeralis media [areola]—Hartig = submedian.

Humeralis media externa [areola]—Foerster 1877 = 1st brachial.

Humeralis media interna [areola]—Foerster 1877 = submedian.

Humeralis postica [area, areola]—Foerster 1877, Hartig = posterior cell.

Humeralnerv—Konow 1901 = interanal.

Humeralquernerv—Enslin 1912 = interanal.

Humerus—Enslin 1912, Morice 1903 = anella.

Humerus—Haliday = submarginal.

Inferi, eure, or [nervure, nervus]—André 1879 = thickened hind margin of fore wing.

Innenrippe—Mayr = submedius + brachius.

Inner apical [cell]—Norton 1867 = 1st brachial.

Inner apical [nervure] 1st—Norton 1867 = nervulus.

Inner apical [nervure] 2d—Norton 1867 = transverse part of discoidens.

Innere Ast der Cubitalrippe—Mayr = cubitas.

Innere Ast der Mittelrippe-Mayr = nervulus.

Innere Mittelzelle-Mayr = submedian.

Intercalarie, s [nervure, nervus, vena]—André 1879, Foerster 1877 = intercalaris.

Intercostalaare—Nielsen and Henriksen 1915 = intercalaris.

Intercostalader—Enslin 1912, Konow 1901 = intercalaris.

Intercostalfeld—Konow 1901 = costal.

Intercostalnery—Konow 1901 = intercosta.

Intercostalquernery—Enslin 1912 = intercosta.

Intercostaltvaeraare—Nielsen and Henriksen 1915 = intercosta.

Intercubital [nervures]—Marshall 1885 = intercubiti.

Intercubitalis [cellula]—Dahlbom = costal.

Interior discoidal [nervure]—Marshall 1885 = 1st recurrent.

Intermedia [areola]—Fallén = 1st cubital.

Intermedia [areola, cellula] $-\overline{D}$ ahlbom, Gravenhorst = 2d cubital.

Intermedia [areola]—Gravenhorst = 2d discoidal.

Intermédiaire [nervure] 1st—Lepeletier = médius + base of discoideus.

Intermédiaire [nervure] 2d—Lepeletier = submedius + brachius.

Intermediate [area]—Kirby = medins.

Interno-medial [cell]—Cresson 1887, Shuckard = submedian.

Internus [nervure]—Latreille = medius + base of discoideus.

 ${\bf Iunctura-Ratzeburg}=junction\ of\ submarginal\ and\ marginal.}$

La cote-Saussure 1852 = costa + metacarpus.

La racine—Tosquinet 1886 = costa + metacarpus.

Lanceolée, ate [áreola, cell, cellule]—André 1879, Cameron 1882. Hartig, Marlatt 1894, Norton 1867, Thomson = anal cell.

Lancetcelle Nielsen and Henriksen 1915 = anellan.

Lancetcelle-Nielsen and Henriksen 1915 = anal cell.

Lanzettförmige Zelle-Enslin 1912 = anellan.

Lanzettförmige Zelle-Enslin 1912, Schmiedeknecht 1907, Zaddach = anal cell.

Le Point—Jurine = stigma.

Le Point épais—Lepeletier = stigma.

Margin [cell]—Shuckard = radial cell as in wasps.

Marginal, e, is [areola, cell, cellule]—Ashmead 1900, Cockerell and Robbins 1910, Cresson 1887, Latreille, Norton 1867, Say 1825, Smith, Thomson = radial.

Marginal [cell]—Ashmead 1900 = radicllan.

Marginal [vein]—Howard 1881, Cresson 1887, Ashmead 1904 = marginal.

Marginal, is [nervus, vein]—Cockerell and Robbins 1910, Cresson 1887, Norton 1867, Thomson = radius.

Marginalis [vena]—Foerster 1877 = costa + metacarpus.

Marginalnerv—Schmiedeknecht 1907 = marginal.

Margino-discoidalis [nervus]—André 1878 = basal.

Media, n. ne [areola, cell, cellule]—André 1879, Berthoumieu 1904, Cameron 1882, Lacordaire, Marlatt 1894 = submedian.

Media [areola] André 1879 = submedicllan.

Medial [cell] 1st—Norton. 1867 = median.

Medial [cell] 2d—Norton 1867 = submedian.

Media, n [nervus, nervure]—André 1879 text, Cresson 1887, Fernald 1906 = medius.

Media, n [nervus, nervure]—André 1879, Morley 1903 = mediella + cubitella.

Media, n, na, ne [nervure, vena]—André 1879 fig., Cameron 1882, Dalla Torre and Kieffer 1910, Hartig, Lacordaire, Marlatt 1894, Morley 1903 = medius + base of discoideus.

Media, us [vena]—Enslin 1912, Foerster 1877, Konow 1901, Morice 1903, = medius + discoideus + subdiscoideus.

Medial cross-vein—MacGillivray 1906 = discoidella.

Medial cross-vein—MacGillivray 1906 = subdiscoideus.

Medial nerve—Morice 1903 = recurrent.

Medial nerve—Morice 1903 = recurrentella.

Medialaare—Nielsen and Henriksen 1915 = medius + discoideus + sub-discoideus.

Medialaare Nielsen and Henriksen 1915 = mediella + discoidella.

Medialader – Friese 1912 = medius.

Medialfeld-Konow 1901 = median.

Medialis-Kieffer 1912 = medius.

Medialnery—Schmiedeknecht 1907 = medius + discoideus.

MediaInery—Enslin 1912, Konow 1901 = recurrent.

MediaInery Enslin 1912 = recurrentella.

Medialquerader—Friese 1912 = basal.

Medialzelle-Kieffer 1912, Schmiedeknecht 1907 = median.

Medialzelle—Konow 1901 = 2d + 3d discoidal.

Medialzelle-Konow 1901 = 1st discoidellan.

Medial, n, ne [cell, cellule]—Ashmead 1900, Cockerell and Robbins 1910, Fernald 1906, de Romand = median.

Medial [cell]—Ashmead 1900, Fernald 1906, Morley 1903 = medicllan.

Medial [vein]—Ashmead 1900, Fernald 1906 = mediella.

Mediane [cellule], apicule—Lacordaire 1834 = 1st brachial.

Mediastina [areola]—Nees = costal.

Mediastinus [nervus]—Thomson = intercalaris.

Medio-cubital cross-vein—MacGillivray 1906 = basal or in some cases posterior abscissa of basal.

Medio-cubital cross-vein—MacGillivray 1906 = basella or in some cases posterior abscissa of basella.

Medio-discoidale, is [nervure, nervus]—André 1879 = nervulus.

Medio-discoidale, is [nervure, nervus]—André 1879 = nervellus.

Medius—Enslin 1912 = mediella + discoidella.

Metacarpus—Marshall 1885, Morley 1903 = metacarpus.

Metacarpus—Marshall 1885 = metacarpella.

Middle vein—Ashmead 1900 = mediclla.

Midtceller [anterior]—Nielsen and Henriksen 1915 = 1st cubitellan.

Midtceller [posterior]—Nielsen and Henriksen 1915 = 1st discoidellan.

Mittelader—Szépligeti 1905 = mediella.

Mittelrippe—Mayr = medius + 1st section of discoideus.

Mittelzelle [anterior]—Enslin 1912, Schmiedeknecht 1907 = 1st cubitellan.

Mittelzelle [posterior] - Enslin 1912, Schmiedeknecht 1907 = 1st discoidellan.

Mittlere Schulterzelle-Szépligeti 1904 = submedian + 1st brachial.

Nervellus - Schmiedeknecht 1907, Szépligeti 1905 = nervellus.

Nervellus -- Morley 1903 = discoidella.

Nervi, nervure, nervus—see explanatory note.

Nervi spurii—Schmiedeknecht 1907 = 2d abscissa of subdiscoideus.

Nervi transversi-Fallén = intercubiti.

Nervulus - Kieffer 1912, Schmiedeknecht 1907, Szépligeti 1904 and 1905 = nervulus.

Nervulus—Szépligeti 1905 (error) = nervellus.

Ober Mittelzelle—Schmiedeknecht 1907 = 1st cubitellan.

Outer apical cell—Norton 1867 = 2d brachial.

Parallelader – Szépligeti 1904 = subdiscoideus.

Parallelnery -Schmiedeknecht 1907 = subdiscoidcus.

Parallele—Wesmael = base of discoideus + subdiscoideus.

Parallelus—Ratzeburg 1848, Schmiedeknecht 1907, Szépligeti 1904 = subdiscoideus.

Parallelus—Schmiedeknecht 1907 (Ichneumonidae) = 1st abscissa of subdiscoideus.

Parastigma—Friese 1911, Schmiedeknecht 1907 = parastigma.

Pobrachial areolet—Marshall 1885 = submediun.

Pobrachial areolet—Marshall 1885 = submediellan.

Pobrachial nervure—Marshall 1885 = submedius + brachius.

Pobrachial nervure—Marshall 1885 = submediella.

Pobrachialis—Haliday = submedius + brachius.

Pobrachial transverse nervure—Marshall 1885 = nervellus.

Pobrachialzelle—Schmiedeknecht = submediellan.

Podiscoidal areolet—Haliday, Marshall 1885 = 1st brachial.

Point epais—Saussure 1852 = stigma.

Post costa—Kohl 1896, Latreille, Thomson = subcosta.

Post costal, e, is—Kirby, de Romand, Shuckard, Thomson = subcosta.

Posterior [areola]—Haliday = 1st brachial cell.

Posterior, ieures [1st]—André 1879, Cameron 1882, Marlatt 1894 = 3d discoidal cell.

Posterior, ieures [2d] = André 1879, Cameron 1882, Marlatt 1894 = 2d brachial cell.

Posterior, ieure—André 1879 = subdiscoideus.

Posterior [1st]—Cameron 1882 = 2d discoidellan cell.

Posterior [2d]—Cameron 1882 = brachiellan cell.

Posterieure—Berthoumieu 1904 = discoidellan.

Posterior vein—Foerster 1877, Haliday, Morley 1903 = submedius + brachius.

Posterior vein—Morley 1903 = submediella.

Postica [cellule]—Dahlbom = posterior cell.

Postica [vena]—Foerster 1877, Hartig, Kohl 1896 = submedius + brachius.

Postica externa—Gravenhorst = 3d discoidal cell.

Postica interna - Gravenhorst = 1st brachial cell.

Postmarginal vein—Ashmead 1904, Cresson 1887, Howard 1881 = postmarginal.

Postmarginalnerv—Schmiedeknecht 1907 = postmarginal.

Prabrachialzelle—Schmiedeknecht 1907 = mediellan.

Praebrachial, is [areolet]—Haliday, Marshall 1885 = median.

Praebrachial areolet—Marshall 1885 = mcdiellan.

Praebrachialis—Haliday = medius + base of diseoideus.

Praebrachial nervure—Marshall 1885 = medius + base of discoidcus.

Praebrachial nervure—Marshall 1885 = mediella.

Praebrachial transverse nervure—Marshall 1885 = basul.

Praebrachial transverse nervure—Marshall 1885 = basella.

Praediscoidal, is [areolet]—Haliday, Marshall 1885 = 1st discoidal.

Pterostigma—Kohl 1896 = stigma.

Punctum—Say 1825 = stigma.

Punctum costale—Fallén = stigma.

Quernery der lanzettförmige zelle—Enslin 1912 = interanal. Querrippe—Mayr = intercubiti.

Radialaare—Nielsen and Henriksen 1915 = radius.

Radialaare—Nielsen and Henriksen 1915 = radiella.

Radialader—Kohl 1896, Szépligeti 1904 = radius.

Radial, e, is [areola, areolet, cellula, cellule, cell]—André 1879, Berthoumieu 1904, Cameron 1882, Costa, Cresson 1887, Fernald 1906, Foerster 1877, Gravenhorst, Haliday, Morley 1903, Jurine, Lacordaire, Lepeletier, Marshall 1885, Norton 1867, Ratzeburg 1848, de Romand, Say 1825, Saussure 1852, Shuckard, Sichel = radial cell or cells.

Radial, e [areola, areolet, cellule or cell]—Berthoumieu 1904, Cameron 1882, Fernald 1906, Marshall 1885 = radiellan cell.

Radial, ale, alis, us [nervi, nervure, nervus, vena, nervure, vein]—André 1879, Ashmead 1900, Berthoumicu 1904, Cameron 1882, Cresson 1887, Dahlbom, Dalla Torre and Kieffer 1910, Enslin 1912, Fernald 1906, Foerster 1877, Haliday, Hartig, Kieffer 1912, Konow 1901, Lacordaire, Lepeletier 1825, Marlatt 1904, Marshall 1885, Morice 1903, Ratzeburg 1848, de Romand, Say 1825, Schenck, Schmiedeknecht 1907, Shuckard, Sichel, Szépligeti 1904, Wesmael = radius.

Radial, ale, alis, us [nervus, nervure, vein]—André 1879, Enslin 1912, Fernald 1906, Marshall 1885, Morice 1903, Sehmiedeknecht 1907, Morley 1903 = radiella.

Radialis [nervus]—Ratzeburg 1848 = stigmal vein (Chalcid).

Radial cellule appendiculated—Say 1825 = 1st + 2d radial.

Radialcelle-Nielsen and Henriksen 1915 = radiellan.

Radialceller-Nielsen and Henriksen 1915 = radial.

Radialfeld—Konow 1901 = median cell or cells.

Radians [nervus]—Dahlbom = medius + base of discoideus.

Radialquernery—Enslin 1912, Konow 1901, Schmiedeknecht 1907 = intervadius.

Radial-scheidnerv-Zaddach = interradii.

Radialtvaeraare--Nielsen and Henriksen 1915 = interradius.

Radialzelle—Dalla Torre and Kieffer, Enslin 1912, Friese 1911, Hartig, Kieffer 1912, Kohl 1896, Schmiedeknecht 1907, Szépligeti 1904, Zaddach = radial cell or cells.

Radialzelle - Enslin 1912 = radiellan.

Radio-medial cross-vein-MacGillivray 1906 = 1st intercubitus.

Radius—Hartig, Jurine, Saussure 1852 = costa + metacarpus.

Radius Haliday = postmarginal.

Radius-Schmiedeknecht 1907 (Chalcid) = stigmal.

Radius, 1st branch of -MacGillivray 1906 = metacarpus.

Radius, 2d branch of—MacGillivray 1906 = 2d interradius.

Radius, 3d branch of—MacGillivray 1906 = apical abscissa of radius.

Radius, 4th branch of -MacGillivray 1906 = 3d intercubitus.

Radius, 4th branch of MacGillivray 1906 = 2d intercubitella.

Radius, 5th branch of -MacGillivray 1906 = 2d intercubitus.

Radius, 5th branch of—MacGillivray 1906 = 1st intercubitella.

Radius inferior—Lepeletier = radius.

Radius superior—Lepeletier = costa + metacarpus.

Ramellus—Schmiedeknecht 1907 = ramulus.

Ramus [eau] marginal, is—André 1879, Foerster 1856 = marginal vein (Chalcid).

Ramus marginalis—Szépligeti 1904 = stigma.

Ramus [eau] humeral, alis—André 1879, Foerster 1856 = submarginal vein (Chalcid).

Ramus [eau] postmarginalis, al—André 1879, Foerster 1856 = postmarginal vein (Chalcid).

Ramus postmarginalis—Szépligeti 1904 = metacarpus.

Ramus [eau, ulus] stigmaticus, al—André 1879, Foerster 1856, Nees = stigmal vein (Chalcid).

Randader—Zaddach = costa + metacarpus.

Randast—André 1879 = marginal.

Randmal—Hartig, Széplegeti 1904, 1905 = stigma.

Randnerv—Zaddach = costa + metacarpus.

Randrippe—Mayr = costa + metacarpus.

Recurrens—Schmiedeknecht 1907 = 1st intercubitella.

Recurrens [1st]—Ratzeburg 1848 tab. fig. 3, = 2d abscissa of discoideus.

Recurrens—Schmiedeknecht 1907 = recurrents.

Recurrens—Széplegeti 1904 = 1st recurrent.

Recurrent, e, es [nervi, nervure, nervus, vein]—André 1879, Ashmead 1900, Berthoumieu 1904, Cameron 1882, Cockerell and Robbins 1910, Cresson 1887, Dahlbom, Fernald 1906, Haliday, Hartig, Jurine, Lepeletier, Marshall 1885, Marlatt 1894, Morley 1903, Nees, Norton 1867, Ratzeburg 1848, Say 1825, Schenck, Thomson, Wesmael = recurrent nervures (1, 2).

Recurrent [1st]—Cresson 1887 (figure) = 2d abscissa of discoideus by typographical error.

Recurrent [1st]—Morley 1903 = transverse part of discoideus.

Recurrent [1st]—Morley 1903 = nervellus.

Recurrent [2d]—Morley 1903 = intercubitella.

Recurrent—Cameron 1882 = recurrentella.

Recurrentes cubitales—de Romand = intercubiti.

Recurrents discoidales—de Romand = recurrents.

Recurrente ordinaire—Berthoumieu 1904 = 2d recurrent.

Recurrentes radiales—de Romand = interradii.

Rucklaufendader, ern-Hartig, Szépligeti 1904 = recurrents.

Rucklaufende—Enslin 1912, Schmiedeknecht 1907 = recurrents.

Rucklaufende—Enslin 1912 = recurrentella.

Schulterast—André 1879 = submarginal (Chaleid).

Schulterrippe—Mayr = subcosta.

Schultersteck—André 1879 = submarginal.

Schulterzelle—Mayr = costal cell.

Sous-costale—Lacordaire = median cell.

Sous-costale—André 1879, Lacordaire = subcosta.

Sous-costale—André 1879 = entire Chalcid renation.

Sous-discoidale—de Romand = 1st brachial cell.

Sous-mediane—de Romand = $submedian\ cell$.

Sous-mediane—Lacordaire = submedius + brachius.

Specularis [areola]—Dahlbom, Fallén = 2d diseoidal cell.

Specularis [area]—Nees = 2d brachial.

Second, secunda etc.—See explanatory note.

Stem of subcosta—MaeGillivray 1906 = intercularis except forks.

Stigma—André 1879, Ashmead 1900, Dahlbom, Enslin 1912, Fernald 1906, Friese 1911, Gravenhorst, Kohl 1896, MacGillivray 1906, Marshall 1885, Nees, Nielsen and Henriksen 1915, de Romand, Say 1825, Schenck, Schmiedeknecht 1907, Thomson, Wesmael = stigma.

Stigma - Ashmead and other authors = stigmella.

Stigmal—Ashmead 1904, Cresson 1887, Howard 1881 = stigmal vein.

Subcosta, al, alis—André 1879, Cameron 1882, Cockerell and Robbins 1910, Dalla Torre and Kieffer 1910, Enslin 1912, Fernald 1906, Haliday. Kieffer 1912, Kohl 1896, Konow 1901, Marlatt 1894, Morice 1903, Nees, Schmiedeknecht 1907 = subcosta.

Subcosta, 1st branch of -MacGillavray 1906 = intercosta or upper branch of intercalaris.

Subcosta—Schmiedeknecht 1907 = submarginal (Chalcid).

Subcosta, al, alis—André 1879, Cameron 1882, Enslin 1912, Fernald 1906, Marshall 1885, Morice 1903 = subcostetta.

Subcostal—Marlatt 1894 = median cell.

Subcostalis—Ratzeburg 1848 = submarginal (Chalcid).

Subcostalaare—Nielsen and Henriksen 1915, = subcosta.

Subcostalaare—Nielsen and Henriksen 1915 = subcostella.

Subdiscoidal—Marlatt 1894 = subdiscoidcus.

Subdiscoidal—Ashmead 1900, Cresson 1887, Fernald 1906 = subdiscoideus.

Subdiscoidal—Shuckard = base of discoidens + subdiscoidens.

Subdiscoidal—Ashmead 1900 = discoidella.

Submarginal, alis—Cresson 1887, Coekerell and Robbins 1910, Latreille, Norton 1867, Say 1825, Smith, Thomson = cubital cells [1, 2, 3, 4].

Submarginalis [areola]—Foerster 1877 = costal cell.

Submarginal, alis—Norton 1867, Thomson = cubitus.

Submarginal [vena]—Foerster 1877 = subcosta.

Submarginal—Ashmead 1904, Cresson 1887, Howard 1881 = submarginal (Chalcid).

Submedialader—Kohl 1896 = submedius + brachius.

Submedian—Ashmead 1900, Cockerell and Robbins 1910 Cresson 1887, Fernald 1906 = submedian cell.

Submedialis [basal or 1st] = Dahlbom 1845, Kohl 1896 = submedian cell.

Submedialis [outer or 2d]—Dahlbom 1845, Kohl 1896 = 1st brachial cell.

Submedialis, an—Cresson 1887, Kieffer 1912 = submedius + brachius.

Submedialis—Schenck = medius + base of discoideus.

Submedian - Ashmead 1900, Fernald 1906 = submediellan.

Submedialquerade [1st]—Friese 1911 = nervnlus.

Submedialquerade [2d]—Friese 1911 = transverse part of discoideus.

Submedialquerader—Kohl 1896 = nervellus.

Submedialzelle [1st]—Kohl 1896 = submedian.

Submedialzelle [2d]—Kohl 1896 = 1st brachial cell.

Submedialzelle-Kieffer 1912, Schmiedeknecht 1907 = submedian cell.

Subradialader—Zaddach = radius.

Subradialis [areola]—Hartig = $costal \ cell$.

Terminalis [area, areola]—Dahlbom = 3d cubital or 2d brachial.

Third—See explanatory note.

Tilbagelobeude aarer-Nielsen and Henriksen 1915 = recurrents.

Tilbagelobeude aarer—Nielsen and Henriksen = nervellus.

Transverso-accessoria—Foerster 1879 = interanal.

Transverse anal.—Berthoumien 1904, Tosquinet = transverse part of discoideus.

Transverso-brachiale, is—André 1879 = intercosta.

Transverse costal—Marlatt 1894 = intercostal.

Transverse [o] cubital, e, is—André 1879, Cameron 1882, Cockerell and Robbins 1910, Costa, Cresson 1887, Fernald 1906, Foerster 1877, Kieffer 1912, Marlatt 1894, Schmiedeknecht 1907, Shuckard = intercubitus or intercubiti (1, 2, 3).

Transverse cubital—Cameron 1882 = intercubitella.

Transverse [o] discoidal, is—Costa, Foerster 1877, Kieffer 1912, Kohl 1896, Norton 1867, Szépligeti 1904 = recurrents.

Transverse discoidal—Cameron 1882 = nervellus.

Transverse-discoidale—André 1879 = transverse part of discoideus.

Transverse-discoidalis—André 1879 = intercubitellae.

Transverse externo-medial—Shuckard = $basal\ vein$.

Transverse-humeralis—Foerster 1877 = nervulus.

Transverso-humeralis—Kohl 1896 = nervellus.

Transverse [o] lanceolate, ée—André 1879, Marlatt 1894 = interanal.

Transverse marginal—Norton 1867 = interradius.

Transverse median [or 1st tr. m.]—Ashmead 1900, Cameron 1882, Cockerell and Robbins 1910, Cresson 1887, Fernald 1906, Marlatt 1894, Shuckard = nervalus.

Transverse median [2d]—Cameron 1882, Marlatt 1894, = transverse part of discoideus.

Transverse median—Ashmead 1900, Cameron 1882, Fernald 1906, Marlatt 1894 = nervellus.

Transversale [e, us] ordinaire, arius—Berthoumieu 1904, Thomson Tosquinet 1896 = nerrulus.

Transverse [o] radial, e, is—André 1879, Cameron 1882, Foerster 1877, Marlatt 1894 = intervadius.

Transverso-subhumeralis—Foerster 1877 = prenervulus.

Transverse submarginal—Norton 1867 = intercubiti.

Transverso-submarginalis—Foerster 1877 = intercosta.

Ulna - Haliday = marginul vein.

Unter-randnerv-Zaddach = subcosta.

Upper Mittelzelle - Enslin 1912 = 1st cubital cell.

Vedhaengscelle—Nielsen and Henriksen 1915 = appendiculate.

Vingemaerke-Nielsen and Henriksen 1915 = stigma.

Vordere-mittelere Schultezelle—Szépligeti 1904 = submedian.

Zweig-André 1879 = stigmal vein (Chalcid).

Zweite-See explanatory note.

LIST OF SYNONYMICAL SYMBOLS.

In this list such terms as "Ist A," etc., can be found either under the letter or under the first figure in the symbol. Terms like "Cell III₄" can be found either under "Cell" or under the roman numeral.

a—Robertson 1902b, 1903b, 1903c, 1904 = basal.

1stA—Comstock and Needham 1898, MacGillivray 1906 = 2d and c.

1stA - MacGillivray = ancllan.

1stA—Comstock and Needham 1898 = submedius.

1stA+2dA—Fernald 1906 = anctlan.

1stA+2dA+3dA—Fernald 1906 = submedius.

1st+2d+3dA+Cu2+1st+2d+3dA—Bradley 1908 = submedius.

2dA -- Comstock and Needham 1898, MacGillivray 1906 = 1st and c.

2dA—MacGillivray 1906 = postellan.

2dA—Comstock and Needham 1898 = interanal.

2dA—MacGillivray 1906 = anella.

3dA - Comstock and Needham 1898, Fernald 1906, MacGillivray 1906, posterior.

3dA—Bradley 1903, Fernald 1906 = anal cell.

3dA—Comstock and Needham 1898 = anal v.

3dA Fernald 1906, MacGillivray 1906 = axillus.

c-v-Comstock and Needham 1898 = 1st interradius.

C-Bradley $19\overline{08} = costal$.

C—Comstock and Needham 1898 = intercalarial; MacGillivray 1906 = intercalarial or costal.

C-MacGillivray 1906 = costellan.

C -Bradley 1908, Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = costa.

C-Fernald 1908, MacGillivray 1906 = costella.

C+Sc-Fernald 1906 = costal.

 $C+Sc+Sc_1$ —Fernald 1906 = costellan.

Cu-Comstock and Needham 1898, MacGillivray 1906, = 1st submedian.

Gu — Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = medius.

Cu -Fernald 1906, MacGillivray 1906 = mediella.

1stA—Comstock and Needham 1906, MacGillivray 1906 = 2d anal cell.

1stA—MacGillivray 1906 = anellan.

1stA—Comstock and Needham 1898 fig. 48 = submedian.

1stA + 2dA—Fernald 1906 = anellan.

1stA+2dA+3dA—Fernald 1906 = submedius.

 $1st+2d+3dA+Cu_2+1st+2d+3dA$ —Bradley 1908 = submedius.

1stM₂—Bradley 1908, Comstock and Needham 1898, Fernald 1906, Mac-Gillivray 1906 = 2d discoidal.

1stR₁—Comstock and Needham 1898, MacGillivray 1906 = 1st radial.

1stIV—Robertson 1904 = median.

2dA—Comstock and Needham 1898, MacGillivray 1906 = 1st anal cell.

2dA—MacGillivray 1906 = postellan.

2dA—Comstock and Needham 1898 = interanal.

2dA—MacGillivray 1906 = anella.

 $2dM_2$ —Bradley 1908, Comstock and Needham 1898, Fernald 1906, Mac-Gillivray 1906 = 2d brachial.

2dM₂—Fernald 4906, MacGillivray 1906 = brachiellan.

2dR₄—Comstock and Needham 1898, MacGillivray 1906 = 2d radial.

 $2dR_1+R_2$ —Bradley 1908, Fernald 1906 = radial.

2ndIV—Robertson 1904 = 1st discoidal.

3dA—Comstock and Needham 1898, Fernald 1906, MacGillivray 1906, = posterior.

3dA-Comstock and Needham $1898 = anal\ vein$.

3dA—Fernald 1906, MacGillivray 1906 = axillus.

3dA—Bradley 1903, Fernald 1906 = anal cell.

Cu₁—Comstock and Needham 1898, MacGillivray 1906 = 2d submedian.

 Cu_1 —Comstock and Needham 1898 = nervulus.

Cu₂—Comstock and Needham 1898, MacGillivray 1906 = prenervulus.

Cu+Cu₁—Bradley 1908, Fernald 1906, MacGillivray 1906 = submedian.

 $Cu + Cu_1 - Bradley 1908 = medius$.

m = Bradley 1908, Comstock and Needham 1898, MacGillivray 1906 = 1st abscissa of subdiscoideus.

m—Fernald 1906, Robertson 1903b = subdiscoidcus.

m - MacGillivray 1906 = basal abscissa of discoidella.

 \mathbf{m}_1 —Fernald 1906 = 1st intercubitella.

m-cu—Bradley 1908, Comstock and Needham 1898 (fig. 48), Fernald 1966, MaeGillivray 1906 = posterior abscissa of basal.

m-cu—Comstock and Necdham 1898 (fig. 38), MacGillivray 1906 (in some figs.) = basal.

m-cu-Fernald 1906 = basal abscissa of cubitella.

m-cu- MacGillivray 1906 = posterior abscissa of basella.

 $m+m_2$ —Fernald 1906 = discoidella.

M—Bradley 1908, Comstock and Needham 1898, MacGillivray 1906 = median.

M—Fernald 1906, MacGillivray 1906 = mediellan.

M—Bradley 1908, Comstock and Needham 1898 (fig. 48), Fernald 1906 = anterior abscissa of basal + base of cubitus.

M—Comstock and Needham 1898 (fig. 38), MacGillivray 1906 (in some cases) = base of cubitus.

M-MacGillivray 1906 = anterior abscissa of basella+base of cubitella.

M₁—Bradley 1908, Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = 3d discoidal.

M₁—MacGillivray 1906 = 2d discoidellan.

 M_1 —Comstock and Needham 1898 = apical portion of cubitus.

1stM₂—Bradley 1908, Comstock and Needham 1898, Fernald 1906, Mac-Gillivray 1906 = 2d discoidal.

2dM —Bradley 1908, Comstock and Needham 1898, Fernald 1906, Mac-Gillivray 1906 = 2d brachial.

2dM —Fernald 1906, MacGillivray 1906 = brachiellan.

 \mathbf{M}_{2} —Fernald 1906, MacChirolay 1906 = binemedian \mathbf{M}_{2} —Fernald 1906 = 2d recurrent.

M₂—Bradley 1908, Comstock and Needham 1898, MacGillivray 1906 = 2d recurrent + second abscissa of subdiscoideus.

 M_2 —MacGillivray 1906 = recurrentella + apical abscissa of discoidella.

 \mathbf{M}_{1+2} —Bradley 1908 = 2d abscissa of cubitus.

 \mathbf{M}_{1+2} —Fernald 1906, MacGillivray 1906 = 3d abscisssa of cubitus.

M₃—Bradley 1908, Comstock and Needham 1898, Fernald 1906, Mac-Gillivray 1906 = 1st brachial.

 M_3 —Bradley 1908 = 2d abscissa of discoideus.

M₃—Comstock and Needham 1898, MacGillivray 1906 = 3d abscissa of discoideus.

M₁—Fernald 1906, MacGillivray 1906 = nervellus.

M₃₊₄—Bradley 1908, Fernald 1906, MacGillivray 1906 = 1st recurrent.

 $\mathbf{M}_{i} + \mathbf{C}\mathbf{u}_{1}$ —MacGillivray 1906 = submedietlan.

 $\mathbf{M}_3 + \mathbf{C}\mathbf{u} + \mathbf{C}\mathbf{u}_4$ —Fernald 1906 = submediction.

 $\mathbf{M}_{3+4} + \mathbf{C}\mathbf{u}_{1+2} + \mathbf{1stA} + 2\mathbf{dA}$ —Fernald 1906 = brachiella.

 $M_{3+4}+Cu_{1+2}+1stA+2d+3dA$ —Bradley 1908, Fernald 1906 = brachius.

M.—Bradley 1908, Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = 1st discoidal.

M₄—Bradley 1908, Comstock and Needham 1898 (fig. 48), Fernald 1906 = 1st abscissa of discoideus.

M_c -Comstock and Needham 1898 (fig. 38), MacGillivray 1906 = 2d abscissa of discoideus.

 M_4+Cu —Fernald 1906 = nervulus.

 M_4+Cu_1 —Bradley 1908, MacGillivray 1906 = nervulus.

M₄+1stM₂-MacGillivray 1906 = 1st discoidellan.

 $M_4+1stM_2+M_1$ —Fernald 1906 = discoidellan.

 $M_4+Cu_{1+2}+1stA$ —Fernald 1906 = submediellan.

 $M_4 + Cu_{1-2} + 1st + 2d + 3dA$ -Bradley $1908 = 1st \ abscissa \ of \ brackius$.

r—Bradley 1908, Fernald 1906 = 1st abscissa of radius.

r—MacGillivray 1906 = 1st interradius.

r-m—Comstock and Needham 1898, MacGillivray 1906, Robertson 1902b, 1903a, 1903c = 1st intercubitus.

r-m+Rs—Bradley 1908, Fernald 1906 = 1st intercubitus.

R—Comstock and Needham 1898, MacGillivray 1906 = 1st cubital.

R—Comstock and Needham 1898 (fig. 38) = subcosta.

R+M—Comstock and Needham 1898 (fig. 48), MacGillivray 1906 = subcosta.

R+M—Fernald 1906 = subcostella.

R+M—MacGillivray $1906 = basal\ part\ of\ subcosta$.

 $R+R_{3+4+5}$ —Fernald 1906 = cubitellan.

 $R+R_5$ —MacGillivray 1906 = 1st cubitellan.

 $R+1stR_1$ —Bradley 1908, Fernald 1906 = 1st cubital.

 $R+Sc_2$ —MacGillivray 1906 = apical portion of subcosta in wings like Xyela.

 \mathbf{R}_{1} —Fernald 1906, MacGillivray 1906 = metacarpus.

R₁—Fernald 1906 = metacarpella.
 R₁—Comstock and Needham 1898 fig. 38 = lower margin of stigma.

 \mathbf{R}_1 —Comstock and Needham 1898 fig. 48 = radius causing truncating of radial.

1stR₁—Comstock and Needham 1898, MacGillivray 1906 = 1st radial.

2dR₁—Comstock and Needham 1898, MacGillivray 1906 = 2d radial.

 \mathbf{R}_{1+2} —Fernald 1906, MacGillivray 1906 = radiellan.

 $2dR_1+R_2$ —Bradley 1908, Fernald 1906 = radial.

 $\mathbf{R}_1 + \mathbf{Sc}_2$ —MacGillivray 1906 = apical portion of subcostella.

 R_2 —Comstock and Needham 1898, MacGillivray 1906 = 3d radial.

R₂—Comstock and Needham 1898, MacGillivray 1906 = 2d interradius.

 \mathbf{R}_3 —Bradley 1908 = 3d cubital.

 R_3 —Comstock and Needham 1898, Fernald 1908, MaeGillivray 1906 = $4th\ cubital$.

R₃—MacGillivray 1906 = 3d cubitellan.

R_s—Bradley 1908, Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = apical abscissa of radius.

 R_3 —Fernald 1906 = apical abscissa of radiella.

 \mathbf{R}_{3+4} —Bradley 1908 = middle portion of radius.

 R_{3+4} —MacGillivray 1906 = 5th abscissa of radius.

 \mathbf{R}_{3+4+5} —MacGillivray 1906 = 4th abscissa of radius.

R₄—Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = 3d cubital.

R₄—MacGillivray 1906 = 2d cubitellan.

R₄—Bradley 1908, Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = 3d intercubitus.

R₄—MacGillivray 1906 = intercubitella.

 \mathbf{R}_{4+5} —Bradley 1908 = 2d cubital.

R₄₊₅+M₁—Fernald 1906, MacGillivray 1906 = apical portion of cubitus.

 $\mathbf{R}_{1+5} + \mathbf{M}_1$ - Fernald 1906 = apical abscissa of cubitella.

R₅ Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = 2d cubital. R_5 —Bradley 1908, Comstock and Needham 1898, Fernald 1906, MacGillivray 1906 = 2d intercubitus.

R₅—MaeGillivray 1906 = 1st intercubitella.

 R_5+M_1 —Fernald 1906, MacGillivray 1906 = 5th abscissa of cubitus.

 $R_5 + M_{1+2}$ —Fernald 1906 = 4th abscissa of cubitus.

 R_3 —Counstock and Needham 1898 = basal abscissa of radius.

Rs-Comstock and Needham 1898, MacGillivray 1906 = base of radius.

Rs-Fernald 1906 = 2d abseissa of radius.

Rs+M-Fernald 1906 = 1st abseissa of radiella.

Rs+M—MacGillivray 1906 = radictlo.

S—Comstock and Needham 1898 = stigma.

Sc—Comstock and Needham 1898 = 1st costal.

Sc—Comstock and Needham 1898, MacGillivray 1906 = intercalaris.

 Sc_1 —Comstock and Needham 1898, MacGillivray 1906 = 2d costal.

Sc:—MacGillivray 1906 = anterior branch of intercalaris, or in some wings intercosta.

Sc₂—MacGillivray 1906 = posterior branch of intercalaris, or in some wings part of stigma.

Sc+R+M—Bradley 1908, Fernald 1908, MacGillivray 1906 = subcosta.

ScM—MacGillivray 1906 = 1st costal.

III₁—Robertson 1903b = apical end of stigma.

 HH_{1+2} —Robertson 1902a, 1902b, 1903c = radial.

III, section 2 of—Robertson 1903b = posterior basal margin of stigma.

III, section 3 of—Robertson 1903b = radius.

HH₄—Robertson 1902a, 1902b = 3d cubital.

HI₄—Robertson 1903b = 3d intercubitus.

 $H1_5$ —Robertson 1902a, 1902b, 1903a, 1903c = 2d cubital.

III₅-Robertson 1902a, 1902b, 1903a = 2d intercubitus.

IV, 1st -- Robertson 1904 = median.

IV, section 1 of Robertson 1904 = anterior abscissa of basal.

IV, 2d-Robertson 1904 = 1st discoidal.

 $1V_2$ —Robertson 1902a, 1903b = 2d recurrent.

IV₃—Robertson 1902a, 1902b, 1904 = 1st recurrent.

V-Robertson 1904 = 2d submedian.

V-Robertson 1904 = 1st brachial.

V, section 2 of —Robertson 1903b = first section of discoidens.

 V_2 —Robertson 1903b, 1903c, 1904 = nervulus.

VI—Robertson 1904 = 1st submedian.

CeH 1st IV—Robertson 1904 = median.

Cell 2d IV—Robertson 1904 = 1st discoidat.

Cell HI₁₊₂—Robertson 1902a, 1902b, 1903e = radial.

Cell III₄- Robertson 1902a, 1902b = 3d cubital.

Cell HI₅--Robertson 1902a, 1902b, 1903a, 1903c = 2d cubital.

Cell IV (1st)—Robertson 1904 = median.

Cell IV (2d)—Robertson 1904 = 1st discoidal.

Cell V—Robertson 1904 = 2d submedian.

Cell V₁—Robertson $1904 = 1st\ brackial$.

Cell VI—Robertson 1904 = 1st submedian.

Section 2 of vein III—Robertson 1903b = lower boundary of stigma.

Section 3 of vein III—Robertson 1903b = radius.

Section 1 of vein IV—Robertson 1904 = anterior abscissa of basal (JG fig. 8).

Section 2 of vein V—Robertson 1903b = longitudinal portion of discoideus (J¹I¹ fig. 8).

Vein a—Robertson 1902b, 1903b, 1903c, 1904 = basal.

Vein Cu₂—Robertson 1904 = prenervulus.

Vein m—Robertson 1903b = subdiscoideus.

Vein r-m—Robertson 1902b, 1903a, 1903c = 1st intercubitus.

Vein III₁—Robertson 1903b = apical end of stigma.

Vein III₄—Robertson 1903b = 3d intercubitus.

Vein III₅—Robertson 1902a, 1902b, 1903a = 2d intercubitus.

Vein IV₂—Robertson 1902a, 1903b = 2d recurrent.

Vein IV₃—Robertson 1902a, 1902b, 1904 = 1st recurrent.

Vein V_2 —Robertson 1903b, 1903c, 1904 = nervulus.

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EXPLANATION OF PLATES.

Drawings made by Miss Mary Carmody, Forest Entomology.

CELLS.

Roman numerals are used to designate the wing areas and, in cases where an area is divided into two or more cells, arabic supernumbers are used to indicate the number of the cell (e.g., C^3 = third cubital cell). The numbering of the cells corresponds in all figures.

I = Costal cell or cells.	X = Intercalarial cell.
II = Radial cell or cells.	XI = Costellan cell.
III = Cubital cell or cells.	XII = Radiellan cell or cells.
IV = Median cell.	XIII = Mediellan cell.
V = Discoidal cell or cells.	XIV = Cubitellan cell or cells.
$V^1 + III^1 = Discocubital cell.$	XV = Submediellan cell.
VI = Submedian cell.	XVI = Discoidellan cell or cells.
VII = Brachial cell or cells.	XVII = Anellan cell.
VIII = Anal cell or cells.	XVIII = Brachiellan cell.
IX = Posterior cell.	XIX = Postellan.

VEINS.

It was found impracticable to use the same lettering in all cases for corresponding veins in the various figures and consequently it is necessary to give a separate key to the veins for each figure. Capital letters are used for the veins of the forewing and small letters for those of the hindwing.

Fig. 1. Xyela julli Dalman.

 $MM^1 = 3d$ Intercubitus. $XX^{1} = Intercalaris.$ II¹ = 1st Recurrent. $AX^{T}B = Costa.$ BC = Stigma. $NN^1 = 2d$ Recurrent. $TT^1 = Nervulus.$ CRD = Metacarpus. $WW^1 = Internal.$ EGB = Subcosta. ab = Costella. HLD = Radius. bd = Metacarpella. $GIG^1 = Cubitus.$ eb = Subcostella. $FJ^{1} = Medius.$ hkd = Radiella. J¹TI¹PS = Discoideus. PN¹P¹ = Subdiscoideus. $gig^1 = Cubitella.$ $UWT^1 = Submedius$, fj1 = Mediella. i¹ts = Discoidella. $T^{1}U^{1}S = Braehius.$ $uu^t = Anella.$ $UW^1U^1 = Anal.$ un = Axillus. $JJ^{\dagger} = Basal.$ hgj1 = Basella. $QQ^{\dagger} = 1st Interradius.$ kk1 = Intercubitella. $RR^1 = 2d$ Interradius. ii¹ = Recurrentella. $KK^1 = 1st Intercubitus.$ tt1 = Nervellus. $LL^1 = 2d$ Intercubitus.

Fig. 2. Euura macgillivrayi Rohwer.

 $TT^1 = Nervulus.$ AB = Costa.ab = Costella. BC = Stigma. be = Stigmella. CH¹D = Metacarpus. EGB = Subcosta. chid = Metacarpella. $HMH^1 = Radius.$ eib = Subcostella. hkh1 = Radiella. $GIG^1 = Cubitus.$ $gig^1 = Cubitella.$ FJ = Medius. $J^{1}I^{1}U^{1} = Discoideus.$ fi¹ = Mediella. its = Discoidella. $PN^{1}P^{1} = Subdiscodeus.$ $ww^1t^1 = Submediella.$ $UT^1 = Submedius.$ t¹w¹ = Brachiella. T¹W¹U¹ = Brachius... $uw^1 = Anella.$ $WW^1 = Anal.$ YY1 = Intercosta. un = Axillus. jhgj¹ = Basella. $JJ^1 = Basal.$ kk1 = Intercubitella. $HK^1 = Ist Intercubitus.$ $MM^1 = 3d$ Intercubitus. ii1 = Recurrentella. tt1 = Nervellus. II¹ = 1st Recurrent. NN¹ = 2d Recurrent.

Fig. 3. Microplitus croceipes Cresson.

Fig. 4. Opius sanguineus Ashmead.

 $\begin{array}{lll} ajb &=& Subcostella. & ut^1 &=& Submediella. \\ bc &=& Metaearpella. & t^1u^1 &=& Brachiella. \\ hh^1 &=& Radiella. & jg &=& Basella. \\ gg^1 &=& Cubitella. & tt^1 &=& Nervellus. \\ ftg &=& Mediella. & gz &=& Postnervellus. \end{array}$

Fig. 5. Labena species.

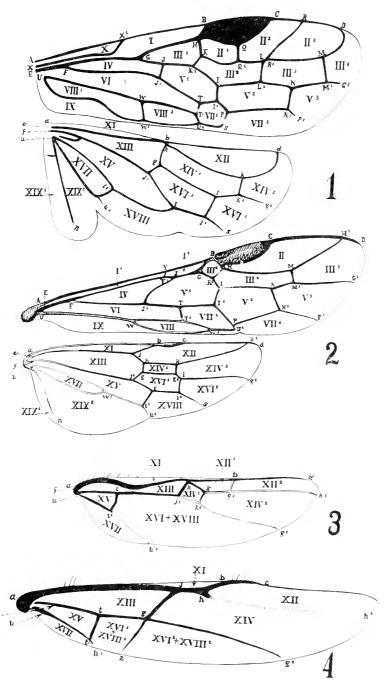
 $NN^1 = 2d$ Recurrent (called Re-AB = Costa.BC = Stigma. current). $J^{1}T^{1} = Nervulus.$ CH¹D = Metacarpus. $HKH^1 = Radius.$ ab = Subcostella. $FJ^1 = Medius.$ bd = Metacarpella. J¹I¹S = Discoideus. $hh^1 = Radiella.$ $PN^{1}P^{1} = Subdiscoideus.$ fg = Mediclla. $gg^1 = Cubitella.$ $JJ^1 = Basal.$ $UT^1 = Submedius.$ ts = Discoidella. $T^1U^1 = Braehius.$ $ut^1 = Submediella.$ $I^{1}K^{1} = Diseocubitus.$ t¹u¹ = Brachiella. $K^1NG^1 = Cubitus.$ $kk^1 = Intercubitella.$ $KK^1 = 1st Intercubitus.$ $gtt^1 = Nervellus.$ $LL^1 = 2d$ Intercubitus.

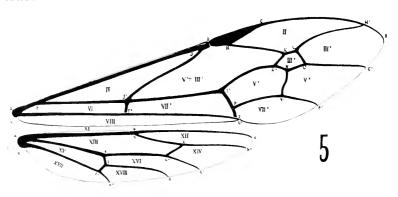
Fig. 6. Helcon species.

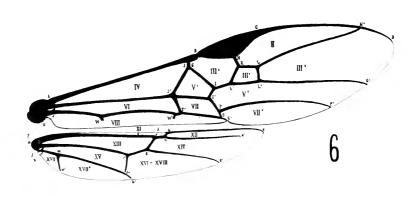
AB = Costa. $J^{1}T^{1} = Nervulus.$ BC = Stigma. W = 1st Interanal. CH¹D = Metacarpa. $W^1 = 2d$ Interanal. $HKH^1 = Radius.$ ab = Subcostella. $GIG^1 = Cubitus.$ bd = Metacarpella. $FJ^1 = Medius.$ $hh^1 = Radiella.$ $J^{1}I^{1}S = Discoideus.$ $gg^1 = Cubitella.$ $PP^1 = Subdiscoideus.$ fj1 = Mediellå. $UT^1 = Submedius.$ $ut^1 = Submediella.$ $T^1U^1 = Brachius.$ $t^1u^1 = Brachiella.$ $JJ^1 = Basal.$ jgj¹ = Basella. $KK^1 = 1st$ Intercubitus. $LL^1 = 2d$ Intercubitus. $i^1t^1 = Nervellus.$ $H^1 = 1st$ Recurrent (called Re- $mm^1 = Interanella$. current).

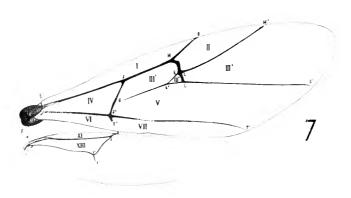
Fig. 7. Disholocaspis species.

 $\begin{array}{lll} EHB = Subcosta, & LL^1 = 2d \ Intercubitus, \\ HLH^1 = Radius, & J^1T^1 = Nervulus, \\ GK^1G^1 = Cubitus, & eb = Subcostella, \\ FJ^1 = Medius, & jj^1 = Basella, \\ J^1P^1 = Discoideus, & fj^1 = Mediella, \\ JJ^1 = Basal, & j^1t^1 = Nervellus, \\ KK^1 = 1st \ Intercubitus. \end{array}$









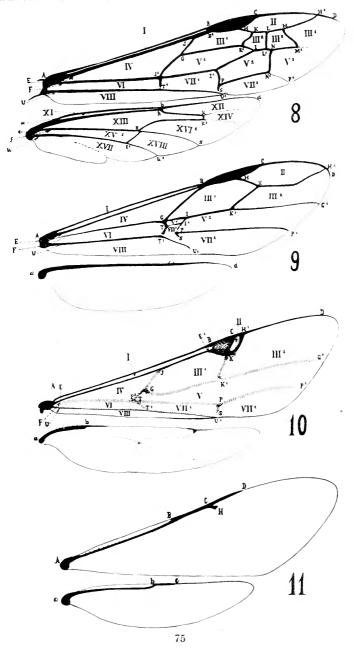


Fig. 8. Philanthus punctatus Say.

AB = Costa. $11^1 = 1$ st Recurrent. $NN^1 = 2d$ Recurrent. BC = Stigma. $J^{1}T^{1} = Nervulus.$ $CH^{1}D = Metacarpa.$ EB = Subcosta. ab = Costella. $HLH^1 = Radius.$ bd = Metacarpella. $GIM^1 = Cubitus.$ eb = Subcostella. $FJ^{1} = Medius.$ hk = Radiella. $J^{1}I^{1}S = Discoideus.$ $gk^1 = Cubitella.$ $PN^{1}P^{1} = Subdiscoideus.$ fg = Mediella. $UT^1 = Submedius.$ gs = Discoidella. $T^1U^1 = Brachius.$ et 1 = Submediella. t¹u¹ = Brachiella. $JJ^{\pm} = Basal.$ kk¹ = IntercubiteHa. $KK^1 = 1st$ Intercubitus. gt¹ = Nervellus. $LL^1 = 2d$ Intercubitus. $MM^1 = 3d$ Intercubitus.

Fig. 9. Fornus species.

PP¹ = Subdiscoideus. $\Delta B = Costa.$ BC = Stigma. $UT^1 = Submedius.$ $T^1U^1 = Brachius.$ CH¹D = Metacarpus. BG = Basal.EB = Subcosta. $HKH^1 = Radius.$ $KK^1 = Intercubitus.$ $GHK^{1}G^{1} = Cubitus.$ $H^1 = 1st Recurrent.$ $TT^1 = Nervalus.$ FG = Medius. $GTI^{1}PS^{1} = Discoideus.$ ad = Costella + Metacarpella.

Fig. 10. Scrphus caudatus (Say).

Fig. 11. Chalcis orata Say.

AB = Submarginal.

BC = Marginal.

CD = Postmarginal.

CH = Stigmal.

ab = Submarginella.

bc = Marginella.

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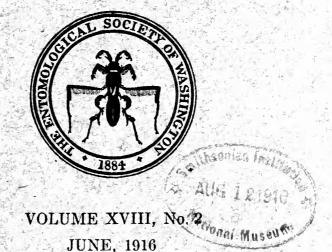
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THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June inclusive, at 8 P. M.

Annual dues of active members, \$3.00; of corresponding members \$2.00; initiation fee (for active members only), \$1.00.

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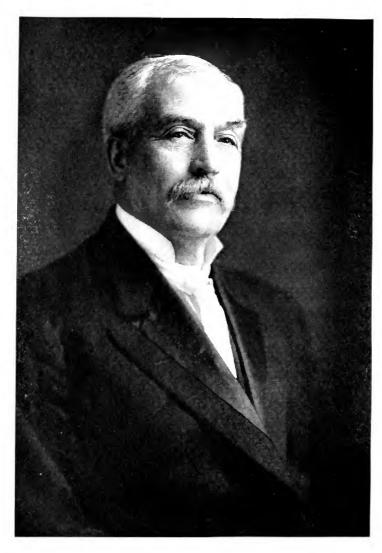
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PROCEEDINGS

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

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Francis Marion Webster.



OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVIII 1916 No. 2

A joint meeting of the Entomological Society of Washington and employees of the Bureau of Entomology was held in memory of Francis Marion Webster on January 14, 1916, at which more than 60 persons were present. The resolutions adopted are printed on a following page.

Reminiscences were given by Messrs. Walton, Hunter, Schwarz, Sasseer, Howard, Marlatt, Currie and Banks illustrating the many-sided character of Professor Webster and showing the prominent part he played in the development of economic entomology in the United States.

Francis Marion Webster

Whereas, the long and useful life of our colleague and friend, Professor Francis Marion Webster, was ended on January 3, 1916; and

Whereas, by his highly intelligent and successful work in Illinois, in Ohio, and in the Bureau of Entomology of the U. S. Department of Agriculture at Washington, he had done much for agriculture in the United States and for the promotion of the science of economic entomology; and

Whereas, at the same time, by his helpful interest in the work of others and by the cordial impetus which he gave to his own assistants, inspiring lasting friendship and respect; and

Whereas, by his blameless and irreproachable life he stood always as an example of the things that are good and fine;

Therefore be it resolved, That the scientific employees of the Bureau of Entomology and the members of the Entomological Society of Washington feel that his death, though crowning a full and well-rounded career, leaves a great gap which, on account of his unique and lovable personality, can never be filled; that he will be remembered by all of us with feelings of admiration and respect, and that the recollection of his qualities will for many years help to strengthen our interest in the cause of entomological science.

Further be it resolved, That the warm sympathy of these organizations is extended to his family, and that copies of these resolutions be forwarded to Mrs. Webster and their children.

FRANCIS MARION WEBSTER.

By L. O. HOWARD.

Francis Marion Webster was born at Lebanon, New Hampshire, August 2, 1849. He was son of J. S. and Betty A. (Riddle) Webster. He married Maria A. Potter, of Sandwich, Illinois, August 21, 1870. He was Assistant State Entomologist of Illinois, 1882-4; Special Agent, U. S. Department of Agriculture, 1884-1892; Entomologist of the Ohio Agricultural Experiment Station, 1891–1902; an assistant on the Biological Survey of Illinois, 1903-4; after which he was appointed to a position in the Bureau of Entomology, U. S. Department of Agriculture, in charge of Cereal and Forage Crop Insect Investigations. He was Professor of Economic Entomology in Purdue University 1885-88, and Consulting Entomologist of the Indiana Experiment Station 1888-1891. He was sent on a mission to the Melbourne, Australia, International Exposition by the U. S. Departments of State and Agriculture in 1888, visiting other portions of Australia, Tasmania and New Zealand, returning in 1889. He was engaged during part of the years 1886-1890 in the solution of the problem of the suppression of the buffalo gnat in the valley of the lower Mississippi River. He was a Fellow of the American Association for the Advancement of Science and of the Indiana Academy of Science. He was a member and ex-president of the Ohio Academy of Science, the American Association of Economic Entomologists and the Entomological Society of Washington. He was a member of the Biological Society of Washington, the National Geographic Society, the American Society of Naturalists, and the Geological Society of Iowa. He was an honorary member of the Entomological Society of Ontario and a corresponding member of the Cambridge Entomological Club and the New York Entomological Society.

This is the brief statement, practically as it appears in Who's Who in America, concerning the career of our fellow member, who died at Columbus, Ohio, January 3, 1916. Since his death three biographical sketches have been published; the first by Mr. W. R. Walton, one of his principal assistants, in Science, February 4, 1916 (Vol. XLIII, No. 1101), the second by Prof. S. A. Forbes, with whom he was formerly associated in entomological work, published in the Journal of Economic Entomology for February, 1916 (Vol. 9, No. 1), and the third by Dr. C. Gordon Hewitt, Dominion Entomologist of Canada, in the Canadian

Entomologist for March, 1916.

The writer was so close to Webster, who has left us so recently, that it is difficult to view his life in perspective, yet it is per-

fectly obvious that his career was so useful and so well rounded that many important lessons can be learned from a study of its

steps and from a general consideration of his character.

In the first place he was a farmer's boy, and not trained in the schools, yet, by his ability and originality and his clear, practical mind, he accomplished work of the highest character, organized a strong branch of the government service, directed the investigations of men of the highest college training, had strong clear ideas as to the direction and aim of college courses in science as applied to agriculture, and was often consulted by teachers in arranging and developing such courses. This statement alone indicates that we are dealing with a most unusual character.

It is probably the fact that he was a farmer's boy that accounts for the turning of his mind to entomological study, and the practical side immediately appealed to him from the fact that his father died when he was fifteen years of age. He married at twenty-one, and a few years later bought a farm in his home county in Illinois (Dekalb County). On his farm he

studied the injurious insects and began to collect beetles.

His first published articles appeared in the Chicago Weekly Interocean for 1874 and consisted of six weekly installments of notes on some of the common injurious and beneficial insects, under the general heading "Entomology and Agriculture." His more serious publishing career, however, began in 1879, in the columns of the Prairie Farmer. His earliest papers relate to the herbivorous habits of certain carabids, and, after several notes on this subject published in different issues of the journal, he brought out, in Bulletin No. 3 of the Illinois State Laboratory of Natural History (November, 1880), a paper entitled "Notes upon the Food of Predaceous Beetles," which attracted very general attention and indicated quite plainly to the few of us who were then interested in such studies that a new and very careful entomological observer had entered the field. This paper showed care in the search of the literature, admirable powers of observation. familiarity with the insects studied, and an unusually strong literary style.

From this time on until the time of his death Webster's bibliography covers rather more than six hundred titles. It is true that very many of these titles are short newspaper articles published in the Ohio Farmer, the American Agriculturist and other agricultural journals, but it is also true that very many others contain the results of original observations and many of

them have a broad character.

¹ See Bibliography of the more important contributions to N. A. Entomology, S. Henshaw, Nathan Banks, U. S. Department of Agriculture, parts IV-VIII, et seq.

Webster, so far as the writer can find, described only one species *Pteromalus gelechiae*. In one of his pape s he refers to the taxonomists as the pioneers attached to an army corps, who blaze the way, make the roads, build the bridges, and thus enable the army of biological and economic workers to follow more smoothly and to realize the direction in which they are going. He, by the way, instances the quarrels of species makers as likely to bring about the same confusion as though the pioneers differed as to the proper construction of a bridge along the path of the army.

He had a philosophical mind, and many of his papers showed this trend. It is not necessary to recall the titles of these papers to those who read this. Perhaps he sometimes went too far, as in his writing on the trend of insect diffusion in the United

States, but it goes to show the breadth of his mind.

We have referred to the fact that so many of his titles are those of newspaper publications. He defends this manner of publication in his annual address as President of the Association of Economic Entomologists delivered at Detroit August 12, 1897, and he argues that the daily and weekly press form better conveyances for placing the results of studies and investigations before the public. "The daily press," he says, "can scatter information broadcast over the land within the space of twenty-four hours and, within a week, place it in the hands of every person who takes even the most isolated weekly paper." He then refers to the unfortunate reputation of the daily press for unreliability of statement, and further s ates that the agricultural press, while affected in this way to a far less degree, still offers a wide field for improvement.

This address as a whole is one of the best things Webster ever wrote. It is entitled "The Present and Future of Applied Entomology in America;" and it is sound, while containing many of his characteristic metaphors and similes. He was

always a good writer.

His best work, on the whole, was done with insects that affect cereal and forage crops, the very field in which he built up his branch of the federal entomological service. His early investigations of the Hessian fly and the chinch bug started him on a long and comprehensive study of 'hese two insects which continued until the day of his death. His joint-worm investigations opened up a field of much biological as well as economic importance, and he deserves the credit of establishing, not only parthenogenesis in the genus *Isosoma*, but a dimorphism and alternation of generations which holds in a perfectly fixed way for one of the important crop pests of this genus, *Isosoma grande*. For many years in Ohio he made notes and careful biological observations upon all

insects affecting this class of crops, and the results of his work down to 1903 are admirably displayed in Bulletin No. 42 of the Division of Entomology, entitled "Some Insects Attacking the Stems of Growing Wheat, Rye, Barley, and Oats, with Methods of Prevention and Suppression." In this admirable bulletin, which contains a very large amount of matter of biological and practical interest, he told for the first time over his own signature the story of the discovery of dimorphism and alternation of generations in Isosoma. He also in this paper gives much attention to the Dipterous enemies of the stems of grains, and years afterwards was able to station Dr. J. M. Aldrich, as a part of his force, in a field near the place of his old observations, to attempt to follow out life histories which he himself had been obliged to leave incomplete. In fact, it may safely be said that cereal and forage crop insects was Webster's own field.

Aside from work in this direction, perhaps the most noticeable work which he did was that upon Simulium in the Mississippi bottomlands, and, in a paper which he read at the twentyfifth annual meeting of the Society for the Promotion of Agricultural Science, he covered in a very excellent way a field well expressed in the title of his paper, "The Suppression and Control of the Plague of Buffalo Gnats in the Valley of the Lower Mississippi River and the Relations Thereto of the Present Levee System, Irrigation in the Arid West and Tile Drainage in the Middle West."

Webster was instrumental in the calling of the first convention for the consideration of a national horticultural quarantine law, and in fact was the originator and promoter of the movement which resulted in the convention of nursery-men, horticulturists, entomologists, and plant pathologists which was held in Washington, D. C., March 5 and 6, 1897. Although no legislation followed this convention, yet as a direct result the original bill was framed and introduced into both branches of Congress, and after a prolonged effort of nearly fifteen years resulted in the final passage of the Federal Horticultural Law in August, 1912.

All the time that Webster was working on these intensely practical questions he carried in the back of his head an intense interest in insect life entirely aside from its economic aspects. and the latest paper which he wrote (not yet pu' lished) dealt with the interesting topic of ethno-entomology, which was read in part at Columbus by Doctor Felt the morning after its author was stricken with the fatal attack of pneumonia which resulted in his death four days later. This manuscript, the hundred or more entomologists who were present at that meeting may be interested to know, has been offered to the Bureau of American Ethnology, and, if they find it impossible to publish it, it will be

sent to his son, R. L. Webster, at the Iowa Agricultural College, who will doubtless find some place where it will be printed.

Webster was a man who had many friends. He was especially liked by our Canadian colleagues, made frequent visits to Canada, lectured before the Ontario Entomological Society, published many notes in the Canadian Entomologist and in the Proceedings of the Entomological Society of Ontario, and held the warm friendship of the late Dr. James Fletcher and his successor, Dr. C. Gordon Hewitt, Doctor Bethune, the late William Saunders and others. In the States he was regarded with warm friendship and affection by a very large class of farmers, fruit-growers, scientific men, and especially by his entomological colleagues. As has been pointed out in two of the biographical sketches cited in an earlier paragraph, he had the respect and affection of his official assistants in the degree that a kind and wise father might have had.

He died at the end of a long and useful career, actively in the harness, but with a most useful life work accomplished, with his children grown up and practically established in life, and after all it was a good way to die.

Two Hundred and Ninety-First Meeting, January 6, 1916.

The 291st meeting of the Society was entertained by Mr. C. L. Marlatt at the Saengerbund Hall January 6, 1916. There were present Messrs. Abbott, G. G. Ainslie, C. N. Ainslie, Barber, Borden, Böving, Busck, Caudell, Craighead, Crawford, Cushman, DeGryse, Duckett, Ely, Fink, Fisher, Gahan, Greene, Hunter, Hutchinson, Hyslop, Kewley, Knab, Kotinsky, McIndoo, Paine, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Simanton, Snyder, Turner, Walton, White and Wood, members and Messrs. C. T. Brues, H. G. Ferguson, H. H. Knight, Frank E. Lutz, C. M. Packard, H. K. Plank, and H. L. Viereck, visitors.

The following new members were elected: Messrs. Arthur N. Borden, G. H. Paine, and R. M. Garner, active members and A. I. Fabis, corresponding member.

The following amendment to the constitution was adopted.

ARTICLE IV. Add Section 2 as follows:

Section 2. The Society may elect, at any regular meeting, by three-fourths majority of the active members present, an Honorary President.

The Honorary President shall hold office until recalled by the Society at any regular meeting through recommendations of the Executive Committee and by vote of three-fourths of the active members present.

ARTICLE V. Add Section 6 as follows:

Section 6. The Honorary President shall be exempt from dues and shall have no specific duties, but he shall be ex-officio a member of the Executive Committee.

Föllowing the adoption of this amendment, Mr. E. A. Schwarz was unanimously elected Honorary President.

At the conclusion of the Presidential address, a vote of thanks was tendered Mr. Caudell for his excellent address.

At the end of the regular program Dr. F. E. Lutz and Dr. C. T. Brues were called on and responded with appropriate remarks.

The following program was presented:

ADDRESS OF RETIRING PRESIDENT.

AN ECONOMIC CONSIDERATION OF ORTHOPTERA DIRECTLY AFFECTING MAN.

By A. N. CAUDELL.

At first glance the subject I have chosen may seem one of little scope, scarcely broad enough for a paper such as the present one. As a matter of fact, however, it is necessary to treat it in a very concise manner in order to keep it within desirable bounds. Therefore the following considerations are condensed as much as is conveniently possible.

Orthoptera directly concerning man, either beneficially or injuriously, affect him either physically or psychically, that is his physical person, externally or internally, or his spiritual or emotional nature. Orthoptera may, to the uninitiated, appear scarcely worth mentioning as directly affecting man injuriously but literature contains a number of incidents of sufficient interest to merit brief reference. Forms injuriously affecting man's person externally is a subject dealing mostly with injuries inflicted by biting. In dealing with this and allied subjects it is not easy to separate popular superstitions from actualities and when the evidence rests upon the observations of laymen it is often more or less faulty. Actual incidents are evidently sometimes exaggerated by recognized observers and more popular and less scrupulous writers often go still further. Inexperienced or ignorant people misconstrue facts and thus our literature teems with ques-

tionable statements. This was especially true in times far past but continues true, unfortunately, to a considerable extent even

A superstition long prevailed in Maryland that if a black beetle, that is a cockroach, enters your room, or flies against you, severe illness, or perhaps even death, follows. As a recent example of evident error in observation I may mention a letter from a physician in New Mexico relating how a boy was bitten on the toe by a Stenopelmatus and, though the toe was immediately incised by a doctor, severe results followed, the boy being in a critical condition for some days and nearly losing his life. While it is very doubtful if the insect was the real cause of the boy's ailment. it is undoubtedly true that at least quite severe mechanical injury and pain may be caused by the bite of orthopterous insects. I have myself been bitten in the palm of the hand by a native Orchelimum, an insect scarcely exceeding an inch in length, so severely as to almost draw blood and similar bites on the finger or back of the hand by some of our larger and more powerful Orthoptera would easily pierce the skin. Davis states that Belocephalus bites severely² and Bernard records natives sleeping in vineyards in France as being bitten by Ephippigera.³ Brunner lost a piece of flesh, bitten out by the powerful jaws of Saga,4 and Wellman writes that Brachytrupes, a large cricket, can draw blood with its strong jaws.⁵ Cockroaches are known to bite off the eyelashes and nibble the toe nails of children in South America⁶ and in addition they scratch the faces of men, bite the greasy fingers of sleeping children⁷ and even eat the toe nails of sailors.⁸ And not only do roaches bite man but they annoy him in other ways. Thus, Rev. Laock, an early Swedish clergyman in Pennsylvania, had a roach enter his ear, causing intense pain until drowned out with water like a rat from its hole.⁹ There are other similar incidents recorded and the name "earwig" was given the Forficulidae by reason of the widespread belief that they habitually enter the ears of man.

Orthoptera directly injuring man's person internally is a subject pertaining mostly to their causing disease and the dissemi-This phase of orthopterous economy is nation of the same.

¹ Cowan's Curious Facts, p. 82 (1865).

² Journ. N. Y. Ent. Soc., vol. xx, p. 305 (1912).

³ Tech. trait. Vigne (1914).

Burr, Proc. S. Lond. Ent. Soc., 1899, p. (11) (1900).
 Ent. News, vol. xix, p. 29 (1908).

⁶ H. H. Smith, In Circular, 2 ser., No. 51, Div. Ent. U. S. Dept. Agric., p. 6 footnote (1902).

⁷ Catesby, Nat. Hist. Carolina, vol. ii, p. 10 (1748). ⁸ Gates, U. S. Naval Med. Bull., vol. vi, p. 212–214 (1912).

² Cowan's Curious Facts, p. 79 (1865).

closely connected with that dealing with external injuries by the entrance of the ear by roaches, etc., as mentioned above, and especially by injuries to the skin by secretions given off by certain species. Thus an African katydid exudes a clear yellowish fluid from pores in the side of the body near the junction of the thorax and abdomen which causes a quite severe eruption if it comes into direct contact with the skin. The natives appreciate and fear this property and its potency was verified experimentally by Dr. H. Stannus, 10 who thinks extensive ulcerations of various parts of the body may sometimes result from this cause when proper medical advise is lacking. Certain earwigs are reported by Dr. Wellman to be considered poisonous by the natives of Angola, and Wellman himself thinks it possible that septic matter may be introduced by a 'bite' from the powerful forceps of the forficulid in question. Hasselt has written on an affection of the lips of persons to whose mouths roaches are attracted for food or

There are few Orthoptera recorded as the direct cause of disease in man. In 1872 there was published in Philadelphia an eight paged pamphlet which reads like a production of pre-Plinyan days. The writer contends that locusts and grasshoppers are the prime cause of the eruptive diseases of living things. proves his assertions by biblical quotations and qualifies as a learned scientist by various interesting statements, such as that houseflies originate from the intestinal worms of man. A more recent charge against Orthoptera as a direct cause of disease in man was brought to the attention of this Society a year ago by Dr. Howard. This was a letter from a correspondent who drank a bottle of soda water and found a decayed roach in the bottom which he considered the cause of Bright's disease, a malady with which he was soon afterwards stricken. While the instances cited above involve elements liable to just criticism, there are others which are at least plausible and some doubtlessly well founded. Thus literature records several cases where grasshoppers, during great invasions, fell into the sea to be later cast ashore in such immense numbers that the air was polluted by the decaying mass. resulting in pestilential conditions costing the lives of many people. Also in times of grasshopper invasions the insects befoul the roofs of houses with their excrement and the rain water drained into cisterns from such roofs is defiled and dysentery

¹⁰ Bull. Ent. Research, Lond., vol. ii, p. 180 (1911).

¹¹ Ent. News, vol. xix, p. 32 (1908).

Tidschr. voor Ent., vol. viii, p. 98-99 (1865).
 Riley, W. D., Locusts and Grasshoppers. The beginning and the

end of the febrile or cruptive diseases in living things.

14 Bull, Bur, Ent. U. S. Dept. Agric., No. 22, p. 106 (1900).

results from mechanical irritation by particles contained in such polluted water. 15

However few or doubtful the records of Orthoptera directly causing disease in mankind, their instrumentality in the dissemination of disease organisms is a matter well worth consideration. Their importance in this respect is, of course, slight as compared with some other groups, especially the Diptera, and this phase of the subject is insignificant as compared with the general subject of medical entomology. But that certain Orthoptera. especially the Blattidae, may yet prove of real importance as disseminators of disease is not to be doubted. That they are well qualified for playing such parts is certain. Many published articles show cockroaches to be veritable hotbeds of various kinds of germs and that they fairly teem with bacterial organisms both inside and out.¹⁶ Their eggs are covered with bacteria when deposited¹⁷ and their feces show micrococci in abundance.¹⁸ They may carry the hypopus stage of the cheese mite¹⁹ and common cosmopolitan species in Denmark have been proven to act as secondary host to a bacillus which produces cancer in rats.²⁰ Morrell concludes that the common croton bug, by contamination with its feces, is able to, and may possibly, play a small part in the dissemination of tuberculosis and in the transmission of pologenic organisms, 21 also that they are in all probabilities an active agent in the souring of milk kept in kitchens and that they are undoubtedly a very important factor in the distribution of molds to foods, etc., in cupboards and cellars. Gates states that roaches may spread typhoid on ships and carry in their intestines and on their feet the organisms of diphtheria, tonsillitis and tuberculosis, 22 and some writers consider them fully as dangerous as houseflies as the virility of bacterial organisms is not diminished by passing through their alimentary tract.²³ A Danish professor claims that cancer is caused by drinking water in which cockroaches have oviposited²⁴ and roaches have been mentioned as possible transmit-

¹⁵ Prout, Journ. Trop. Med. and Hygiene, p. 137-139 (1908).

¹⁶ Herms and Nelson, Amer. Journ. Pub. Health, vol. iii, p. 229 (1913), Sartory and Clere, C. R. Soc. Biol., vol. lxiv, p. 545 (1908), and Barber, Philippine Journ. Sci., vol. vii, p. 521-524 (1912).

¹⁷ Petri, Mem. d. R. Stazione di Palol. Vegetale, Rome (1909).

¹⁸ Northrup, Tech. Bull. Mich. Exp. Stat., No. 18, p. 25 (1914).

¹⁹ Ealand, Ins. and Man, p. 244 (1915).

²⁰ Fibiger, Berliner Klin, Wochenschr., vol. 1, p. 289-298 (1913), Fibige Hospitalstid, Copenhagen, vol. lvii. p. 1049-1112 (1914), and Fibiger ar Ditlevsen, Contr. biol. morph. Spiroptera (1914).

²¹ British Med. Journ., p. 1531 (1911).

²² U. S. Naval Med. Bull., vol. vi, p. 212 (1912).

Longfellow, Amer. Journ. Pub. Health, vol. iii, p. 58-61 (1913).
 Nordlyset, New York, Febr. 20, p. 8 (1913).

ters of the tropical disease beri-beri.²⁵ Roaches have also been considered in connection with the carrying of the vibrios of Asiatic Cholera²⁶ and, in common with many other insects, they have been investigated as possible factors in the cause and spread of pella-

gra, but with negative results.²⁷

There are few published references of Orthoptera, other than the roaches, as disease earriers, the only one now recalled being the spread of cholera for long distances by migratory locusts in Africa.²⁸ It is recorded that grasshoppers in times of invasions leave a chole a-like pestilence in their w ke and they are also accused of carrying into uninfested regions the foot and mouth disease of cattle.29

Aside from physical effects, either external or internal as discussed above, man is injuriously affected directly by orthopterous insects searcely at all. Aside from disagreeable odors of such species as cockroaches, etc., that offend his olfactory sense, his psychic nature is practically unaffected. True, his nervous system may now and then be more or less shocked from fright, as in the case recently recorded of terror caused in a Philadelphia school by the issuance of yo ng mantids from the ootheca.³⁰ A heroic janitor with a mop handle came to the rescue in this case. It reminds me of the first mole cricket I ever saw and of how gleefully I carried my wonderful prize home, only to have it

killed 'good and dead' by my frightened mother.

Orthoptera beneficially related to man directly may be divided, like those injuriously affecting him, into those affecting him physically and those influencing him psychically. The first group comprises species used in medicine and those eaten as food. former, I believe, is a matter based almost entirely on pristine beliefs and popular fallacies. A common European katydid is given the common name "wartbiter" from the belief prevalent in Swe 'en that its bite removes warts.³¹ Burr remarks that it is possible that the wound caused by the insect, together with the action of formic acid often exuded from the jaws of angry Orthoptera, and a goodly amount of faith on the part of the wart-stricken individual might indeed cause these mysterious growths to disappear. Ancient lore is replete with all kinds of cures attributed to various insects. The following recorded instances may be

²⁵ Van der Scheer, Journ. Trop. Med., vol. iii, p. 96-97 (1909); Manson, Tropical Diseases 4 edit.), p. 376 (1907).

 ²⁷ Barber, Philippine Journ. Sei., vol. ix. p. 1-4 [1914].
 ²⁷ Jennings, Amer. Journ. Med. Sci., vol. exlvi, p. 418 [1913].
 ²⁸ Rilev, Ref. Handb. Med. Sci., vol. v, p. 75 (1887).
 ²⁹ Kannemeyer, Trans. S. Afr. Philos. Soc., vol. viii, p. 84-85 (1893).
 ²⁰ Kannemeyer, Trans. S. Afr. Philos. Soc., vol. viii, p. 84-85 (1893).

Ent. News, vol. xvi, p. 292 1905).
 Proc. S. Lond. Ent. Soc., 1899, p. (11) (1900).

mentioned as pertaining to the Orthoptera. A leg of Gryllus boiled in water prevents retention of urine by man and animal.³² Cockroaches bruised and mixed with sugar cure ulcers and cancers and kill worms in children; the ashes of burned roaches are an effective physic³³ and the inner viscera of roaches boiled in oil cure earache.³⁴ Cockroaches are made into tea and formed into pills for various ailments of man and powdered and extracted in alcohol they are a remedy for dropsy. 5 Oil of forficulids rubbed on the temples, wrists and nostrils strengthens the nerves; ashes of house crickets cure weak sight and enlarged tonsils and triturated bodies of migratory locusts, with proof spirits, cure haemorrhoids and quench thirst. 56 There are many more such records of the remarkable medicinal properties of Orthoptera but no more need be repeated here.

As an article of food the Orthoptera are of real importance and the general use of insects as food for man is not only a matter of ancient history but of the present times as well. Dr. Howard has but recently urged experiments along this line³⁷ and man of many climes annually consume considerable quantities of insects and insect products. Were the present paper one dealing with insects in general this one topic of their use as food would be quite enough for one evening's discussion. Confined to the Orthoptera it is limited mostly to a consideration of the edibility of locusts, or grasshoppers. Other families of Orthoptera however enter somewhat into the diet of man and even the unsavory cockroach. when properly salted, is said to have an agreeable flavor for those fond of highly flavored dishes. Personally, however, I have formed no liking for roaches as food, in spite of the fact that on a trip through the west I had them served to me alive in strawberries, a la carte with fried fish, and baked in biscuits.⁶⁹

At least one genus of Phasmidae serve as food for man, the natives of Woodlark Island eating a species of Karabidion. 40 Gryllidae, too, are eaten, field crickets being an article of diet in Jamaica when that island was first discovered, 41 and the natives of Africa eat quantities of Brachytrupes, which they dig from their burrows and prepare for the pot by removing the legs and wings. 42 The Orthoptera most extensively used as food are, as stated above,

³² Sanchez, Datos para la Medica Mexicana (1893).

³³ Sloane, Hist. Jamaica, vol. ii, p. 204 (1707-25).
³⁴ Cowan's Curious Faets, p. 82 (1865).
³⁵ Bogomolow, St. Petersb. Med. Wochenschr. (1884).

Ealand, Insects and Man, p. 217 (1915).
 Monthly Letter, Bur. Ent. U. S. Dept. Agric., No. 18, p. 1 (1915).

³⁸ Lugger, 3 Repts. Minn. Exp. Sta., p. 36 (1898).

³⁹ Ent. News, vol. xv, p. 63 (1904).

⁴⁰ Montrouzier, Fauna Woodlark, p. 82 (1855). Sloane, Hist. of Jamaica, vol. ii, p. 204 (1707-25).
 Wellman, Ent. News, vol. xix, p. 29 (1908).

locusts, or grasshoppers. There is no doubt but that wholesome and palatable dishes may be prepared from the bodies of these insects and a somewhat extensive use is now made of them for this purpose by the natives of many regions. Ansorge says that John the Baptist needs no pity by reason of his entomological diet as he should tire of honey sooner than of locusts." That the flavor of well cooked locusts is not distasteful is vouched for by no less an authority than Dr. C. V. Riley. A somewhat extensive experiment was seriously carried out by Dr. Riley and others and the results summed up in his candid statement that, from personal experience, he considered our common locust more palatable when cooked than some animals commonly served on our tables.44 In this experiment, which was given considerable newspaper notoriety at the time, locusts were prepared in various ways, all proving satisfactory. Ancient and recent literature is rich in reference to this subject and an interesting compilation of older accounts may be found in Cowan's Curious Facts, pages 120-131. I wish here to refer to but one of these ancient items, a poetic inventory of the larder of a poor Athenian family. writer, Alexis, says:

> For our best and daintiest cheer, Through the bright half of the year, Is but acorns, onions, peas, Ochros, Lupines, radishes, Vetches, wild pears nine or ten, With a locust now and then.

Under the title "Why not eat insects?" Vincent M. Holt has published an undated booklet of 99 pages treating of insects as food and, while the menus suggested seem ludicrous, he is evidently sincere in his arguments. Recipes are given for the preparation of locusts and the writer attests their palatability from personal experience and the testimony of others. I quote a menu from this work as a matter of interest, though locusts do not happen to be included in it:

Snail Soup.
Fried soles, with Woodlonse Sauce.
Curried Cockchafers.
Fricassée of Chicken with Chrysalids.
Boiled leg of mutton with Wire-worm sauce.
Ducklings, with Green Peas.
Canliflowers garnished with Caterpillars.
Moths on toast.

⁴³ From Under the African Sun (1900).

⁴⁴ Proc. Amer. Assoc. Adv. Sci., p. 208–214 (1875).

The above menu, of course, sounds absurd, but is a raw oyster more attractive, gastronomically, than a well prepared locust? I say 'well prepared locust,' for nothing favorable can be said of illy prepared concoctions such as an unauthenticated account credits certain Indians with using, that is, fatty juices dipped from decayed masses of locus's and eaten as a salad. There is a justified vagueness as to the details of this practice but such salads need not be compared with the undoubte lly tasty and nutritious preparations civilized man might enjoy could he only overcome prejudices and eat insects. Chemical analysis shows locusts to possess a high nutritive value, 45 we have divine permission from the Bible to use them as food, 46 and they are admittedly tasty morsels, therefore why, indeed, not eat them?

My final topic, Orthoptera directly affecting man's psychic nature beneficially, is one of some importance. Man's aesthetic nature is appealed to by the beauty of many forms, his musicloving soul is soothed by their song and his sporting proclivities are gratified by contests of strength and valor between pug-

nacious males of certain species.

As objects of beauty a considerable number of Orthoptera are rivaled only by the most brilliantly colored butterflies. For example, certain giant lobe-crested grasshoppers of South America have the under wings brilliant with various hued tints, so blended as to incite the admiration of the most stolid observer. Certain mantids of the Old World are so constructed in form and color as to resemble brightly colored orchids. There are also many Orthoptera of more somber hues which are objects of admiration by reason of their wonderful forms, some exhibiting a maryellous array of spines and flanges, and others are so constructed as to perfectly mimic in form or color certain objects, as bark, twigs, etc. Our common walking stick insect resembles, when at rest, the twigs among which it lives so perfectly as to merit our appreciation. Still other Orthoptera, which are neither brilliant in color nor striking in structure, are objects of interest by reason of their gracefulness of form or agility of motion.

The songs of insects has been enjoyed and applauded by man since the dawn of history and among our musical insects the Orthoptera are dominant. So musical are the notes of some of our orthopterous songsters that it is difficult to express their melody. The rhythmic beat of the tree-cricket has been termed by Burroughs as a "slumberous breathing," while Hawthorne describes it an "audible stillness" and declares that "if moon-

light could be heard it would sound like that."47

4 Leviticus, Chapter xi, par. 22.

⁴⁵ Howard, 1st Rept. Locust Bur., p. 63-69 (1997).

⁴⁷ McNeill, Ent. Amer., vol. v, p. 103 (1889).

Various efforts have been made to set to music the notes of Orthoptera. Scudder made the attempt with the songs of a number of species⁴⁸ and Regen has attempted it with the notes of Thamnotrizon. 49 The results of these efforts look interesting but a lack of musical training prohibits my judging their merit.

A species of large katydid is kept captive by natives in South America for the sake of its song⁵⁰ and the natives of Africa are lulled to sleep by the song of caged crickets.⁵¹ Some species, indeed, are objects of barter in some regions. Thus gryllids are sold in little cages in the streets of Florence on Ascension day as songsters⁵² and caged crickets are sold in Portugal for their song and for the good luck which they are supposed to bring their

Considerable use is made of Orthoptera in sport, especially in China and Japan. The Chinese are much given to gambling and will bet on anything and are said to win and lose fortunes on cricket fights as American sportsmen win or lose at horse races. In China the fighting crickets are trained and cared for as carefully as if they were blooded horses. They are given a fixed diet, partly of honey and boiled chestnuts, and if one falls ill it is fed on mosquitoes. A good cricket fight will last half an hour and, to win, one of the combatants must slav his adversary or throw him bodily over the six-inch wall inclosing the arena. These fighting crickets, which are all males, are bought and sold like horses, one with a good record bringing five or ten dollars, while a champion often sells for as much as fifty dollars.

My initial plans for the present discussion included the consideration of the economic relations of the Orthoptera to man both directly and indirectly. But I soon decided that the first, and by far the smaller, phase of this general subject would suffice even when discussed as briefly as above. The second phase, even if treated as briefly as I have covered my subject this evening, would form a paper far too long for such an occasion. Even the one subject of injurious locusts and the havor they play with vegetation would require a paper as long, if not longer, than that which I have presented this evening, and I therefore leave the consideration of their indirect relations for some future time.

⁴⁹ Sitz. ber. Akad. Wiss. Wien. Math.—Nat. Klasse, vol. x.vii, p. 487-488 (1908).

⁴⁸ Hitchcock's Rept. Geol. N. Hampshire, vol. 1, p. 362–380 (1874); twenty-third Ann. Rept. Ent. Soc. Ontario, 1892, p. 62–78 (1893).

Bates, Journ. Ent., vol. i, p. 474-477 (1863).
 Moufet, Ins. Theatr., p. 136 (1634).
 Burr, Proc. S. Lond. Ent. Soc., 1899, p. (12-13) (1900).
 Bather, Bull. Brooklyn Ent. Soc., vol. viii, p. 56 (1913).

In discussing the address Mr. Schwarz stated that during the great grasshopper invasion of the western states, some of the residents had been compelled by lack of other food to eat grasshoppers. He spoke of having once sampled grasshopper soup and pronounced it excellent in taste.

Mr. Hunter congratulated Mr. Caudell on his address and regretted that more attention was not given to references to insects in classical literature and folk lore. Mr. Hunter also stated that the disease Beriberi occurred in various parts of the United States.

A NEW SPECIES OF AGROMYZA DESTRUCTIVE TO BEANS IN THE PHILIPPINES.

By J. R. Malloch, Urbana, Illinois.

This species was sent me by Professor Baker with the information that it is very destructive to beans in the Philippines. It works in the stems of young plants and sometimes destroys whole fields. In a later letter he adds the information that it "often causes extensive damage in planting of cowpeas, mungo, and beans." The following description is printed as a name is desired for the species.

Agromyza destructor new species.

Female.—Shining black. Head entirely black, center stripe opaque, orbits and frontal triangle glossy black, with a bluish tinge. Thorax and abdomen with a slight tinge of blue. Legs entirely black. Wings clear, veins black-brown. Halteres black.

From slightly over one-third the head-width, sides distinctly convergent anteriorly, the anterior width little more than half the posterior width; triangle very long and slender, its length about twice its posterior width, reaching almost to anterior margin of froms; orbital bristles 4 in number, decreasing slightly in length towards front; orbits narrow, distinctly differentiated from center stripe, without distinct hairs; third antennal joint small, round; arista bare; check short, not over one-sixth the eyeheight, not produced anteriorly, marginal hairs normal. Mesonotum with 2 pairs of dorso-centrals, discal setulae not numerous. Costa to end of fourth vein; inner cross-vein below end of first, and at two-lifths from apex of discal cell; last section of fourth vein about five times as long as preceding section; last section of fifth about two-thirds as long as preceding section.

Length, 0.5-0.75 mm.

Type locality: Los Banos, Philippine Islands (C. F. Baker).

NEW TACHINIDAE FROM NORTH AMERICA.

By Harrison E. Smith.

Bureau of Entomology, Cereal and Forage Insect Investigations.

Following are the descriptions of one new genus and five new species of Tachinidae taken in the United States, with several notes upon species belonging to this family heretofore described.

Hypochaeta eudryae, new species.

Length 5 to 7 mm.; black, bronzy gray pollinose species. Front in each sex distinctly wider than either eye, frontal vitta varying from faintly yellowish to golden gray pollinose, about three times as wide as sides of front. Ocellar bristles reclinate, frontal bristles descending nearly to the base of the third antennal joint, the sides of the front bearing a few scattered bristly black hairs outside of each frontal row. Eyes hairy. First two antennal joints yellowish, the third joint from four to five times as long as the second. Arista thickened on the basal fourth to one-third, the penultimate joint as broad as long. Sides of face about one-fifth as wide as the facial depression, bristles on the facial ridges ascending three-fifths of the distance from the vibrissae to the base of the antennae. Vibrissae inserted on a level with the front edge of the oral margin, palpi and tip of probosis yellow.

Dorsum of the thorax bronzy gray pollinose, the vittae indistinct. Three dorso-central and two sternopleural macrochaetae. Scutellum bearing a discal pair of macrochaetae, three pairs of marginals and a longer cruciate apical pair. Tibiate yellowish, the middle tibiae on the outer side bearing two or more strong bristles near the middle.

Hairs of the abdomen depressed, the second segment bearing a pair of median discal and marginal macrochaetae, the third segment a discal pair and a marginal row and the fourth a discal and marginal row.

Wings hyaline, the apical cell ending but little before the extreme wing tip, the first longitudinal vein bristly almost to the tip, the third vein bearing two or three bristles at its base. Calypteres whitish.

Described from one male and one female taken at Oswego, New York, June 11, 1897, one female from the White Mountains (Morrison) and one female (Holotype) reared from Eudryas grata, April 12, 1911, from a larva taken at Newton, Mass. All of the material placed in the collection of the U. S. N. M. from which it was kindly loaned to me by Mr. Frederick Knab, with the exception of the holotype which was reared at the Gypsy Moth Laboratory.

Holotype: Cat. No. 20175 U.S. N. M.

Hypochaeta townsendi, new species.

Differs from *H. cudryae* as follows: Length 6 to 7 mm. Abdomen coxae, femora and tibiae reddish yellow, first two joints of the antennae, palpi

and tip of probosis yellow. Front nearly as wide as either eye, outside of the frontal row, a row of weaker bristles, the three uppermost simulating orbital bristles. Frontal vitta, sides of front and the parafacials gray pollinose, faintly tinged with yellow, as viewed from above. Thorax and scutellum black, bronzy gray pollinose, thoracic vittae indistinct. Median abdominal vitta blackish, middle tibiae on the outer side bearing a single bristle near the middle. Apical cell ending in the costa close to the extreme wing tip.

Described from a single male specimen taken at Miami, Florida, October 27th, by Dr. C. H. T. Townsend, after whom the species is named.

Holotype: Cat. No. 20176 U. S. N. M.

Winthemia okefenokeensis, new species.

Length 8 mm. Black, gray pollinose. Front in male about three-fifths as wide as either eye, frontal vitta opaque brownish black, wider than either side of front. Frontal row of bristles descending to base of third antennal joint, outside of these scattered bristly black hairs. Parafrontals and sides of face silvery gray pollinose, the bristly hairs on lower half of parafacials irregularly disposed. Cheeks about one-fifth the eye height, palpi yellow. The third antennal joint faintly tinged with rufous at its base, about two and one-fourth times as long as the second.

Thorax black, golden gray pollinose, marked with four broad black vittae. Four postsutural and three sternopleural macrochaetae. Scutellum wholly black, bearing three pairs of long marginal macrochaetae and a shorter cruciate apical pair. Discal scutellar bristles present. Legs black, the hind tibiae ciliate with bristles of equal length, middle tibiae bearing a single bristle on the outer side near the middle. Front tarsi greatly dilated, the pulvilli longer than the last tarsal joint.

Sides of the first three abdominal segments and the fourth segment reddish yellow. Abdominal macrochaetae confined to a marginal row upon the third and fourth segments. Hairs of abdomen long, depressed. Venter of the third and fourth segments beset with a distinct patch of long bristly hairs, on either side of the median.

Base of wings and along the costa to the tip of the first longitudinal vein tinged with yellowish. Apical cell open, the third longitudinal vein bearing one or two bristles at its base.

Described from a single male specimen taken in June, 1912, on Billy's Island, in the Okeefenokee Swamp, Georgia, by Mr. J. Chester Bradley.

Holotype: Cat. No. 20054 U. S. N. M.

Amobia utahensis, new species.

Length 13 to 14 mm. Silvery gray pollinose species, head slightly wider than thorax, front at base of the antennae, as viewed from the

side, projects nearly four-fifths the horizontal diameter of the eye. Antennae black, not reaching below the middle of the face, the second and third joints of nearly equal length. Arista thickened on at least the basal two-fifths, the penultimate joint as broad as long. Frontal bristles not descending below the base of antennae, outside of these numerous bristly black hairs. Eyes bare, sides of front and the parafacials concolorous, densely silvery gray pollinose, the sides of face bearing many irregularly disposed bristly black hairs. Vibrissae inserted far above the level of the front edge of the oral margin, proboscis short, the palpi black. Genae a rich velvet reddish brown. Cheeks broad, well covered with bristly black hairs. Facial plate deeply concave, hardly wider than the sides of face.

Thorax densely gray pollinose, marked with three wide black dorsal vittae, either side of the wide median vitta an indistinct narrow vitta which gradually disappears just beyond the transverse suture. Post-sutural macrochaetae four, sternopleura bearing two strong bristles with many long bristly hairs between, several of which approximate the true macrochaetae. Scutcllum bearing three pairs of strong marginal and several diseal macrochaetae. Legs including the coxae black, the tarsal claws clongate.

Abdomen elongate conical, gray pollinose, marked with three rows of semi-triangular contiguous black spots. First and second abdominal segments bearing a median marginal pair of macrochaetae, the third a marginal row and the fourth a marginal row and sub-marginal pair.

Wings hyaline, the third longitudinal vein bearing two or three bristles at its base, callypteres milky white faintly tinted with yellow along the borders.

Described from a single male specimen taken in the Logan Canon, Utah. by Mr. E. P. Hoff. (The date of collection upon the locality label, pinned beneath the specimen is not plainly descernible, but is apparently July 4, 1909.)

Holotype: Cat. No. 20055 U. S. N. M.

Parkeriellus, new genus.

Genotype: Parkeriellus flavipalpis new species.

Head wider than the thorax, sides of face on the lower half bare, frontal bristles in a single row, descending to the base of the third antennal joint, frontal vitta opaque brownish black, not as wide as the sides of front. Ocellar bristles directed forward. Vibrissae cruciate, placed on a level with the front edge of the oral margin. Facial ridges bristly on the lowest fourth to one-third. Parafacials less than one-third as wide as the facial depression. Eyes bearing short scattered hairs, penultimate joint of arista as broad as long. Checks about one-fifth as wide as the eye height. Abdomen short conical, bearing discal and marginal macrochaetae. Ovi-

positor broad, nearly one-half as wide as its length, shining black, somewhat sickle shape. (This type of ovipositor is unique in character, and of a type not previously noted by the writer.) Wings hyaline, the apical cell ending in the costa but slightly before the extreme wing tip.

Parkeriellus flavipalpis, new species.

Length 7 mm. Front about one and one-fifth times as wide as either eye. Parafrontals gray pollinose; as viewed from above, faintly tinged a golden hue, sides of face, genae and facial depression silvery gray pollinose. Antennae black, extending nearly to the oral margin, the third joint two and one-half times as long as the second, arists thickened nearly to the middle. Palpi yellow. Two pairs of strong proclinate orbital bristles in the female, sides of front bearing a few weak scattered hairs outside of the frontal row.

Thorax and scutellum concolorous, dull bronzy gray pollinose, four indistinct black vittae, gradually disappearing toward the posterior margin. Three postsutural and three sternopleural macrochaetae. Scutellum bearing a discal pair, three pairs of long marginals and a shorter cruciate apical pair of macrochaetae. Legs black, the middle tibiae each bearing a single bristle on the outer side near the middle, hind tibiae sub-ciliate.

Abdominal segments except the first, grayish pollinose on the basal two-thirds, the first segment bearing a pair of median marginal macrochaetae, the second a discal and marginal pair, the third a discal pair and a marginal row and the fourth segment a discal pair and a sub-marginal row. Hairs of abdomen depressed

Posterior end of the hind cross-vein ending nearer to the bend of the fourth longitudinal vein than to the small cross-vein, the third longitudinal vein bearing two or three bristles at its base.

Described from a female specimen taken at Laurel, Montana, August 9, 1914, by Dr. R. R. Parker, in honor of whom the generic name has been proposed.

Holotype: Cat. No. 20053 U. S. N. M.

Neodichocera tridens, Walton.

A male specimen of this species taken on the Gallatin Mountain, Montana, June 30, 1914, by Dr. Ralph R. Parker, thus adding a new locality record for this most interesting species, but recently described.

Paradmontia brevis Coq.

I also have two male specimens of this species which were taken at Laurel, Montana, July 9, 1914, by Dr. R. R. Parker.

Neophorichaeta johnsoni Smith.1

I am under obligations to Dr. C. H. T. Townsend in kindly calling my attention to the possible synonymy of the above species with that of *Tricogena setipennis* Coq.² Mr. W. R. Walton has graciously compared the paratype of N. johnsoni with Coquillett's holotype of setipennis and finds them identical. Coquillett had the female and the specimens from which N. johnsoni were described were the males. Thus, N. johnsoni becomes a synonym of Tricogena setipennis Coq.

Two Hundred and Ninety-Second Meeting, February 6, 1916.

The 292nd meeting of the Society was entertained by Dr. L. O. Howard at the Saengerbund Hall, February 3, 1916. There were present Messrs. Ainslie, C. N. Ainslie, C. G. Baker, Barber, Borden, Böving, Busck, Caudell, Craighead, Crawford, Cushman, DeGryse, Elv, Fink, Fisher, Gahan, Garner, Greene, Heinrick, Heidemann, Howard, Isely, Kewley, Knab, Kotinsky, Middleton, Paine, Pierce, Quaintance, Rohwer, Sanford, Schwarz, Shannon, Simanton, Snyder, Turner, Walton, Webb, and Wood, members, and H. A. Ingerson and T. D. Urbahns, visitors.

The following program was presented:

A new Interpretation of the Relationships of Temperature and Humidity to Insect Development. By W. Dwight Pierce.3

MORE LIGHT ON MYIOPHASIA.4

(Diptera, Tachinidae.)

By J. M. Aldrich.

Cereal and Forage Crop Insect Investigations, Bureau of Entomology.

After reading with much interest the analysis of this group published in the September number of the Proceedings (vol. xvii, pp. 107-114), the thought occurred to me that it might be possible to get additional information about Wiedemann's Montevideo specimen, type of aenea and this species the type of Myiophasia. I accordingly addressed a letter to the well-known Vienna

¹ Psyche, vol. xxii, No. 3. ² Revis. Tach., p. 130.

³ Withdrawn for publication in Journ. Agr. Research.

⁴ Published by permission of Chief of Bureau.

dipterist Friedrich Hendel, asking him to look at the type and answer certain specific questions about it, also to send sketch of head profile and wing.

Owing to the absence of Hendel, the latter was answered by Dr. Zerny, Custodian of Diptera, giving the following information:

Wiedemann's type is a male in pretty poor condition. The eyes are naked; I enclose a diagrammatic drawing of the head in profile. The bristling of the abdomen is for the most part lost by abrasion; but it can be seen that on the first and second segments macrochactæ are wholly wanting; on the third and fourth the scars of a row of marginal bristles are present on each. A sketch of the wing-venation is also enclosed.

The three specimens from Georgia $(2 \circlearrowleft 7, 1)$ \circ agree perfectly with the type; the eyes are naked in both sexes, the apical cell

open.

The part of the work of Brauer and Bergenstamm in which *Myiophasia* was published, appeared at the latest in November 1891; *Myiophasia* therefore has priority over Townsend's name, which was published in December.

The accompanying pencil sketches, copied by me with the

utmost care, are submitted herewith.

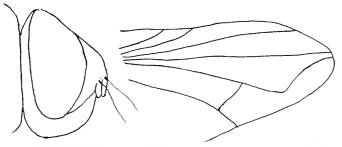


Fig. 1. Myiophasia aenea, type; from sketches by Dr. H. Zerny.

The letter and wing figure appear to settle beyond all further question that Mr. Townsend's *Phasioclista metallica* is a synonym of *Muiophasia aenea*.

Incidentally, the establishment of this fact has some bearing on Mr. Townsend's theory that the various forms of *Myiophasia* are each closely associated with a certain ecological environment. *Aenea*, it appears, occurs from Montevideo to Maryland and Illinois; I have it also from New Bedford, Mass., and Fort Collins, Colo. Townsend recognizes seven principal life zones, of which this form has been collected in five. Referring to his tabulation (op. cit., p. 111), it appears that *setigera* has been collected

twice, in two zones; setigera oregonensis twice, in two zones; clistoides twice, in two zones; mesensis once, necessarily in one zone; sierricola twice, in one zone; robusta once, necessarily in one zone; ruficornis twice, in two zones; nigrifrons several times, through a range of five zones; globosa several times, through a range of five zones. Looking at the facts from this point of view, one would hesitate to say, "The impress of the environment is upon each of them."

In discussion of this paper Dr. Townsend presented the following:

NOTE ON MYIOPHASIA AENEA WD.

By Charles H. T. Townsend.

Dr. Aldrich has kindly sent me letter received from Dr. H. Zerny, of the Vienna Museum, giving certain structural details of the holotype of this species, together with a drawing showing venation and side view of head. The holotype is a male. In my synopsis of the Myiophasia group published in the Proceedings of the Society last year, the characters furnished by Zerny lead unmistakably to couplet 11, and there agrees with Phasioclista in the absence of median marginal macrochaetae on second abdominal segment. But otherwise they agree with Myjophasia and not with Phasioclista. Males of the form given as Phasioclista metallica in my synopsis, from the Atlantic coast region, show the front not produced in profile and the hind crossvein normally in middle between small crossvein and bend of fourth vein. The drawing by Zerny shows the front well produced and the hind crossvein nearer to bend of fourth vein (20) mm. from small crossvein and 13 mm. from bend), agreeing perfectly with males of Myiophasia setigera from the western mountain region (New Mexico).

The information supplied by Zerny is thankfully received, but does not decide the matter. The lack of bristles on second segment of Wiedemann's holotype may be abnormal. A good series of specimens from Montevideo, the holotype locality, as well as further study of the holotype in connection with same, will be absolutely necessary to decide the question. In any event, the characters furnished by Zerny show that aenea Wd. is not conspecific with *metallica* Towns., and hence will need a new name,

as it is preoccupied by *Tachina aenea* Mg. (1824).

In this connection, I note that my original description of Phasioclista metallica does not agree fully with the specimens of the form given under that name in the above-mentioned synopsis. Either there is some variation yet unaccounted for or two forms have been confused. The holotype of *metallici* and a series from the holotype locality must be studied to decide this point.

NOTES ON SOME GENERA OF SYRPHIDAE WITH DESCRIPTIONS OF NEW SPECIES.

By R. C. Shannon, Bureau of Entomology.

This paper includes synopses of the genera Chrysogaster and Caliprobola, the latter genus in this country hitherto included un-The kind interest and assistance which Dr. Alder Brachupalpus. drich and Messrs. Knab, Crawford and Barber have taken in various ways has had much to do with its preparation. material used is from Dr. Aldrich, Mr. Banks, the Biological Survey and the National Collection.

Genus Chrysogaster Meigen.

The genus Chrysogaster in North America can be divided into four distinct groups, as is shown below in the table. Verrall, in his British Syrphidae, has a table which separates the British species into three groups which he designates by their subgeneric names, but the comparison of these groups with our species shows intergrading differences and affinities. Although our groups are distinct, their species are, as a rule, closely allied to each other.

Loew² has described a species, nigrovittata, which has the third antennal joint almost three times as long as broad. This species belongs to the group of which stigmata Will, is typical, as is indicated by the wing venation and color of the legs. The writer has seen only one species in this group with antennae as long as Loew described for nigrovittata and this is stigmata (see table). Specimens now in the National Collection which were determined by Williston and recorded in his synopsis of the Syrphidae as nigrovittata are placed by the writer under other species, sinuosa and parva, n. sp. Paul R. Jones' records two females of nigrovittata from Idaho. He states that the antennae are a trifle longer than indicated in Loew's description.

¹ Brit. Flies, VIII, p. 186, 1901.

² Zeitschr. für Naturw. XLVIII, No. 14, p. 323, 1876.

Ent. News, 18, p. 238, 1907.
 Ent. News, XVIII, p. 238, 1907.

TABLE OF SPECIES.

1.	At least first two tarsal joints yellow or yellowish red. Antennae
	elongate; apical cross vein rectangular or directed slightly inwards;
	stigma about as long as distance between the tips of second and
	third vein; mesonotum with coppery vittae. (Group 1) 2
	Legs entirely dark 5
2.	Eyes with several linear markings
	Eyes with only a faint median transverse stripe 4
3	Vertical markings on eyes very labyrinthine, last section of fourth
υ.	vein at the middle with an inward angulation which bears a stump
	and terminating beyond tip of the second vein; wings with blackish
	markings on the outer cells
	The vertical markings on the eyes fairly regular; last section of fourth
	vein without the angulation and stump; wings with spot only at tip
	of second vein and sometimes one at tip of fourth veinbellula Will.
4.	Cross veins with brownish cloudspictipennis Loew.
	Wings entirely hyalinepulchclla Will.
5.	Last section of fourth vein (apical cross vein) recurrent on its distal
	half; stigma only about as long as distance between the tips of
	second and third veins; antennae not very small, sometimes elon-
	gate; a whitish pollinose band extends across face just below anten-
	nae, except in stigmata and possibly in nigrovittata, and below this
	band the face is rugulose. (Group 2)
	Last section of fourth vein directed obliquely outward in its distal
	portion
c	Third antennal joint approximately three times as long as broad. 7
υ.	
-	Third joint less elongate
1.	Pile on frons and ocellar triangle blacknigrovittata Lw.,
	Pile on frons and ocellar triangle whitishstigmata Will.,
8.	Squamae and halteres darkened
	Squamae and halteres whitish
9.	The transverse pollinose band below antennae reduced almost to two
	spots at the eye margins; from black; arista a little shorter than the
	antennaestigmata Will., ♀
	The pollinose facial band complete and distinct; from greenish
	metallic 10
10.	The vittae on the mesonotum very faint, paler than rest of dorsum
	arista a little longer than the antennae; rather large, robust species.
	robusta n. sp.
	Vittae on mesonotum coppery colored; arista a little shorter than
	antennae; small species
. 1	
11.	Dark, greenish black species; pile on ocellar triangle and from rather
	long and dark
	Dark steel blue species with very short whitish pile on frons and ocellar
	triangle

- 12. Entire abdomen unicolorous with thorax and as distinctly punctured.

 unicolor n. sp.
 - Disc of abdomen subopaque.....sinuosa Bigot.

- 15. Squamae with a darkened tinge; pile on the frons rather long.

 inflatifrons n. sp.

Squamae whitish; pile on the frons in male rather short.. texana n. sp.

Chrysogaster stigmata Will.

The description of this species was based upon specimens from California. Three specimens, two males and one female, from Moscow, Idaho, sent by Professor Aldrich, agree with the types except that they are somewhat blacker in color, but this is not a sufficient difference to separate them. The antennae of the female are less elongate, the third joint being only a little more than one and a half times as long as broad; the third joint differs further from that of the male in being broadly reddish on the lower margin.

Chrysogaster robusta, new species.

A rather large, robust species for this genus; dark greenish bronze.

Male: Ocellar triangle and frons bronzy green, with conspicuous, pale brownish pile. Antennae blackish, reddish on under side of third joint, which is a little longer than broad; arista dark, very minutely pubescent and but little longer than antennae. Face greenish black, with short white pile, rather gently excavated, mouth margin reaching forward as far as antennal prominence; a distinct whitish pollinose band extending across to the eyes and below this the face is broadly, faintly rugulose. Thorax with very short, pale brownish pile; mesonotum with two median, very faint stripes. Disc of abdomen subopaque, shining at the sides. Hypopygium rather large, with abundant, short, whitish pile. Wings slightly smoky. Squamae whitish and halteres yellowish. The first

tarsal joint of the hind legs somewhat swollen. Length, 7.5 mm.; wing 5 mm.

Allotype Female: Differs from the male as follows: Frons rather smoothly, transversely rugose, interrupted medianly by a very shallow longitudinal furrow, the pile short, yellowish brown. Stripes on the mesonotum more distinct, silvery green. Abdomen nearly as broad as long. Length about 6.5 mm.; wing 5 mm.

Pacific Grove, California, two males and two females, May 9, 1906, wet meadows in woods (J. M. Aldrich).

Type: Cat. No. 20279 U. S. N. M.

This species appears to be closely related to *C. stigmata* Will., but this latter species has elongate antennae, shorter pile on the frons and the pollinose band below the antennae is represented by only two silvery spots at the sides.

Chrysogaster parva, new species.

Small, light greenish bronze species.

Male: With whitish, short pile on ocellar triangle and frons, shorter on the frons. Antennae fulvous, darker on upper margin, third joint a little longer than broad, arista dark, a little shorter than antennae and without perceptible pubescence. Face greenish black, with whitish pollinose band below the antennae and beneath this broadly, faintly rugulose; the pile white, very short and scattered. Thorax with very short brownish pile; mesonotum with four faint copper-colored vittae. The subopaque disc of the abdomen surrounded by shining sides. Hypopygium large, with inconspicuous, white pile. Wings somewhat smoky. Squamae whitish; halteres yellowish. First tarsal joint of the hind legs not swollen. Length: 5 mm.; wing about 4 mm.

Allotype Female: Frons greenish black, with transverse rugose ridges, interrupted medianly by a longitudinal, very shallow depression and with very short, whitish pile which is longer on ocellar triangle. The vittae on the mesonotum more distinct than in the male. Abdomen broad and oval. Length about 5.5 mm.; wing about 4.75 mm.

Colorado, nine females, one male (four of these were placed by Williston under $C.\ nigrovittata$); Lake Tahoe, California, one male and one female; Ormsby, Nevada, one \circ , July 6 (C. F. Baker); Reno, Nevada, one \circ (H. F. Wickham); Garland, Colorado, a pair in copulation, June 18.

The four specimens mentioned last are larger than the others. *Type*: Cat. No. 20280 U. S. N. M.

The types are labeled only "Colorado."

This species is very closely related to *robusta*, but is smaller and much less robust, the pile on the frons is shorter, the arista shorter and apparently entirely without pubescence, while there

are four vittae on the thorax instead of two, and these are coppery colored. The first joint of the male hind tarsi is also noticeably more slender.

Chrysogaster pacifica, new species.

Large, robust, dark, greenish bronzy black species, the largest of this group.

Male: Ocellar triangle and from with rather long blackish hairs. From shining black, noticeably inflated. Antennae reddish brown, third joint twice as long as broad; arista darker, a little longer than antennae. Face shining, black, with short whitish pile, not excavated and the mouth margin but little produced and not reaching as far forward as antennal prominence. A whitish pollinose stripe extends across to the eyes just below the antennae and below this the face is broadly, faintly rugulose. Thorax with very short, whitish pile. Mesonotum with four dark vittae. Disc of abdomen subopaque. Wings somewhat smoky. Squamae blackish, the halteres darker. Length 8.5 mm.; wing 6 mm.

Type: Cat. No. 20281 U. S. Nat. Mus.

Described from two males without locality labels but labelled "Collection Coquillett" and determined by Coquillett as C. nigrovittata, which is a Californian species (the different length of antennae distinguishes it at once from nigrovittata). Since much of Coquillett's early material was from California and since he determined it as a species described from California, the surmise that California is the habitat for this species would seem justified.

This species is easily recognized by its large size, rather long, dark pile on the frons and the straight face with the mouth margin but slightly produced. It resembles *Chrysegaster robusta* somewhat in general appearance, but its longer antennae and the color of the squamae and halteres at once distinguish it.

Chrysogaster sinuosa Bigot.

Medium sized, dark, steel blue species.

Male: Frons and ocellar triangle bluish black, with blackish hairs. Antennae reddish yellow, darker on upper margin, third joint about one and one-half times as long as broad; arista darkened at the base, yellowish towards the tip, a little longer than the antennae. Face shining bluish black, entirely bare but for a few hairs along the eyes; just below the antennae, a whitish pollinose cross band extends to the eyes, the face faintly rugulose below this. Face receding, the mouth margin but little produced. Thorax with minute whitish pubescence. Mesonotum with four distinct blackish vittae. Disc of abdomen subopqaue, the rest of the dorsum shining. Hypopygium prominent, with whitish pile. Wings with a blackish tinge. Squamae and halteres blackish. Length: 7 mm.; wing 5 mm.

Female: From with very short pile, longer on the vortex, with the

transverse rugosity interrupted down the middle. The frons widens rather gradually toward the antennae. Wings, squamae and halteres paler than in the male.

Four males and two females: "Washington Territory;" Seattle, Washington, May 22, 1897; Moscow, Idaho, June 2, 1908 (J. M. Aldrich); Moscow Mountain, Idaho (J. M. Aldrich); Oregon, (Koebele); Mono Lake, California, July 23, 1911 (J. M. Aldrich).

The specimens, now in the National Collection, four from Colorado and one from Washington Territory, which Williston recorded as nigrovittata Loew in his "Synopsis of North American Syrphidae" do not fit the description that Loew gave for the length of the third antennal joint. The four specimens he had from Colorado now form part of the material of C. parva, a new species described in this paper; his other specimen, from Washington Territory, except for a few minor points, fits the description of Bigot's C. sinuosa, which Williston had placed as a synonym of C. stigmata.

C. sinuosa may be recognized by its dark steel blue color, the fulvous antennae, darkened squamae, halteres and wings, and the microscopic pubescence on the body. The third antennal joint varies somewhat in size in the male. In the Oregon specimenit is a little longer than in the others, while in the specimen from

Moscow Mountain, Idaho, it is nearly as broad as long.

Chrysogaster unicolor, new species.

Medium sized, dark steel blue species; the entire dorsum of the abdomen unicolorous with the thorax.

Female: From shining, bluish black, with the transverse ridges more broadly separated and the longitudinal, median dividing ridge broader than in the other species of this group; pile short and pale. Antennae elongate, first and second joints darkened, third reddish brown, darker on the upper margin and about two and one-half times as long as broad; arista darkened at the base, becoming lighter towards the tip. Face dark steel blue, with a pollinose, whitish band extending across to the eyes just below the antennae and below this broadly, faintly rugulose; a tubercle or swelling on each side of the face below near the eyes. Thorax with microscopic pile; mesonotum with four blackish vittae, the outer ones very faint. Abdomen entirely dark steel blue, the same as the thorax. Wings, squamae and halteres darkened. Length: 7 mm.; wing 5.25 mm.

Two females from Ormsby County, Nevada (type locality), July 6 (C. F. Baker); Reno, Nevada (H. F. Wickham).

Type: Cat. No. 20282 U. S. N. M.

This is the only species of this group in which the disc of the abdomen is not subopaque, but unicolorous with the mesonotum.

Chrysogaster nigripes Loew.

Rather small, dark species. The apical cross vein is bent inward to join the third vein. Stigma much longer than the distance from the tip of the second vein to tip of the third. Legs entirely black.

Male: Ocellar triangle raised and with rather short black pile. Frons but little inflated, shining bluish-greenish black, the pile black, longer than on the ocellar triangle. Antennae quite small, third joint ovate, yellowish brown, the arista darker. Below the antennae a transverse whitish pollinose band extends to the eyes. Face colored as the frons, with a small tubercle. Thorax velvet black with numerous irregular metallic greenish spots enclosing punctures, more or less confluent at the sides, and a pair of rather ill-defined stripes of the same color on the dorsum midway of the middle and the sides; pile short and rather dense, blackish. Scutellum concolorous with mesonotal punctures. Dorsum of abdomen opaque, the sides shining, dark metallic green. Wings with a distinct blackish tinge. Squamae and halteres darkened. Length: about 6 mm.; wing about 4.5 mm.

Female: More bluish or greenish than the males, immature specimens purplish. The pile everywhere shorter, being hardly noticeable. Frons transversely rugose, interrupted at the middle by a longitudinal ridge, above the antennae smoothed, with depression in the middle and somewhat produced forward. The eye margins but little wider below than at vertex. Antennae noticeably larger than in the male, yellow, somewhat darkened. Below the antennae a whitish, pollinose band extends across to the eyes. Mesonotum and scutellum dark metallic blue, unspotted and without stripes. Wings a little clearer, in immature specimens hyaline, and the squamae paler than in the male. Length: about 5.5 mm.; wing about 4.5 mm.

Specimens from Ontario, Maine, New Hampshire, Massachusetts, Connecticut, New York, Maryland, Virginia, North Carolina, Georgia.

Chrysogaster inflatifrons, new species.

Large species, color dark greenish black. The apical cross vein not recurrent, stigma much longer than the distance between the tips of the third and fourth vein. Legs entirely black.

Male: Ocellar triangle prominent, with black pile. The frons well puffed out, shining, with rather long, black hairs. Antennae reddish yellow, the arista blackish; third joint ovate, nearly as broad as long. Below the antennae a whitish pollinose band extends across to the eyes. Face with large rugulose spots on the sides above and with a small tubercle. Mesonotum velvety black and with many punctures which are enclosed by metallic greenish spots and with dense, short, blackish pile; scutellum unicolorous with the spots on thorax. Dorsum of abdomen subopaque,

the sides shining, dark greenish black. Wings and squamae slightly blackish, the halteres darker. Length: about 8 mm.; wing about 6 mm.

North Carolina, four males (Morrison).

Type: Cat. No. 20283 U. S. N. M.

This species is closely related to *C. nigripes*. The larger size, the greater swelling of the frons in the male, which also has noticeably longer pile, the longer pile on the thorax and scutellum and the absence of the stripes on the mesonotum distinguish it from *nigripes*. The antennae are also larger.

Chrysogaster texana, new species.

Male: Bright steely blue. Ocellar triangle prominent, with black pile. Frons well puffed out, highly polished, steel blue, with rather short black pile. Antennae yellowish, the third joint darkened above, ovate, nearly as broad as long, arista blackish. A whitish pollinose band below the antennae extends to the eyes. Face with arcuate rugulose spots directed toward the antennae and with rather poorly defined tubercle. Thorax with short dark pile; mesonotum without stripes. Dorsum of abdomen subopaque, the sides bright steel blue. Legs entirely dark. Wings hyaline; squamae whitish; halteres dark. Length: 6.5 mm.; wing 6 mm.

Female: Shining, metallic blue. From transversely rugose, with a longitudinal ridge down the middle, above the antennae smooth and produced forward. Antennae reddish, arista blackish. Below the antennae a rather broad band extends across to the eyes; margin of the eyes noticeably wider below than at vertex. Thorax shining metallic blue, with very short pile, the mesonotum without vittae. Wings hyaline; squamae tinged very slightly; halteres dark. Length: 7 mm.; wing 5.5 mm.

Willis, Texas, one male and one female.

Type: Cat. No. 20284 U. S. N. M.

This species is separated from *C. nigripes* by the absence of the vittae on the mesonotum and the pale wings and squamae; the male differs in the greater inflation of the frons, the female by the eyes more widely separated below.

Genus Caliprobola Rondani.

Brachypalpus pulcher and sorosis were described by Williston in his Synopsis of the Syrphidae in the genus Brachypalpus, although, in his table of species he separated them off under a subgenus, Caliprobola, a genus which Rondani¹ established in 1844 for Milesia speciosa. Verrall² in his British Syrphidae re-

² Brit. Flies, VIII, p. 627, fig. 430.

¹ Ann. Sci. Nat. Bologn. (ser. 2) II, p. 455.

describes this genus and species, detailing characters which he considers distinguish it from the closely allied genera Cynorrhina, Milesia, Spilomyia, and Temnostoma. Pulcher and sorosis must be referred to Caliprobola, since they agree in all generic characters except that they possess small spines on the lower margin of the hind femora; the absence of these spines or bristles Verrall claims to be an essential character for the typical European species. Verrall states that the subgenus which Williston used in his table is not the true Caliprobbla, as it has bristles present on the hind femora. But even C. speciosa has "tiny bristles beneath the hind femora," as is stated by Verrall himself in his description of this species. The material before me tends to show that this is a specific rather than a generic character. C. aldrichi, new species, has the spines very minute, in this respect agreeing closely with C. speciosa. A character seemingly of more importance is the brilliant bronze aeneous color of the abdomen which is similar to our Chrysochlamys croesns O.S., and even more so to Callicera aenca Fabr. of Europe. At the present time the catalogues list only two species under this genus; speciosa from Europe and cimbiciformis Portsch, from Siberia. Sack has described a species C. aurea from Transcaspia (Beil. Progr. Gymn. Wohler, vol. 42, p. 28, 1910).

Brachypalpus and Caliprobola may be distinguished as follows:

Head not noticeably triangular shaped, face largely yellow, abdomen bright aeneous with opaque cross bands; thorax without vittae,² hind femora with short bristles beneath, sometimes very small

Caliprobola.

TABLE OF SPECIES.

³ One ♀ specimen of pulcher has a faint band.

¹ In Williston's table, the true *Brachypalpus* are said not to have short bristles below.

² With proper reflection two median ones are scarcely perceptible on individual specimens.

Wings slightly infuscated, first and second basal cells hyaline; anterior cross-vein very oblique, joining discal cell noticeably beyond the middle; first abdominal segment opaque, its anterior angles aeneous pulcher Will.

All the femora blackish, yellowish at tips and bases; cross-vein joins discal cell a short distance beyond middle........crawfordi n. sp.

Caliprobola pulcher Will.1

Head distinctly broader than high. Frons in male yellow, with microscopic pubescence which is longer along the eyes. Arista dark, more than twice the length of antennae, and with minute pubescence along entire length. Frons in female black with yellowish, pollinose sides and short fuscous pile. Wings hyaline, darkened somewhat along veins. Length: Male 14–17 mm., wing 11–13 mm.; female 13 mm., wing 11 mm.

Five males and two females: "Washington Territory" (type specimen); Mt. Hood, Ore., ♂ and ♀. The following is material loaned by Mr. Banks: Marys Peak, Ore., July 18, 1914 (L. G. Gentner), Pamelia, about 3000 ft. alt., Mt. Jefferson, July 27, 1907, and Mt. Jefferson, July 15, 1907 (J. C. Bridwell Coll.); Corvallis, Ore., Sept. 20, 1914 (A. F. Barss Coll.). This last specimen is the female which unlike the others of this sex has a narrow, interrupted opaque band on the fourth abdominal segment. The band on this segment is characteristic of the females of sorosis and its ally crawford; but not of pulcher and its allies, aldrichi and opacus. The antennae are missing in this specimen but it agrees otherwise with C. pulcher female.

Caliprobola opacus, new species.

Rather slender, with head but little broader than high; dorsum of thorax entirely subopaque black; abdomen bright metallic green with several opaque cross-bands; wings strongly infusented anteriorly.

Male: Frons reddish brown, silvery pollinose along sides; no pile. Antennae reddish yellow; third joint broader than long, darkened anteriorly; arista brownish, less than twice the length of antennae. Ocellar triangle black and with blackish pile. Pile of thorax deep brown, yellow

¹ Syn. Syr., U. S. N. M. Bull. 31, 1886, p. 223, pl. X, fig. 9a, b, c.

along posterior margin of scutellum and on post-alar calli. Abdomen bright metallic green; second segment with two opaque black cross-bands, the first one on the anterior margin; third segment similarly ornamented, but with the second opaque band very narrow; fourth segment entirely metallic green, longer than broad. Femora of the front and middle legs brownish black exteriorly, reddish brown on inner sides, yellow at bases and tips; hind femora blackish on more than basal half, yellow distally. All the tibiae and first three joints of tarsi yellow, the other tarsal joints black. Length: Body about 15 mm.; wing 10 mm.

Female: From aeneous black, reddish brown above antennae, with very narrow whitish pollinose stripes along eyes and with a flat surface, not depressed. Legs as in male, except that hind femora are yellow at base; hind tibiae, except at base, nearly as thick as femora. Scutellum with almost entirely black pile. Length about 12 mm.; wing 11 mm.

Kanaka Bay, San Juan Islands, Washington, one male, type, May 31, 1906 (J. M. Aldrich); Ft. Wrangel, Alaska, one female allotype (Wickham).

Type: Cat. No. 20287 U. S. N. M.

Caliprobola aldrichi, new species.

Very similar to *opacus* but more robust, head obviously broader than high; abdomen brilliant bronze, with the pile more golden.

Female: Frons depressed, dull aeneous black, somewhat reddish above antennae, with dark brown pile and very narrow whitish pollinose stripes along eyes. Dorsum of thorax sub-shining black, with dark brown pile; meso-pleurae with rather long golden pile; posterior margin of scutellum and post-alar calli with yellow pile. Abdomen banded similarly to opacus. Fore femora dark on outer side, yellow on inner side; middle femora almost entirely yellow; hind femora yellow, a dark band around the middle; the rest of legs yellow, except the last two joints of all the tarsi. Wings infuscated anteriorly, darkest along the veins. Length: Body about 12–14 mm., wing 11–12 mm.

Described from three females: Mt. Rainier, Washington, above Longmires, 5000 ft., Aug. 3, 1905 (J. M. Aldrich).

Type: Cat. No. 20288 U. S. N. M.

I have great pleasure in naming this species in honor of Professor J. M. Aldrich, who very generously sent me certain new species of Syrphidae in order that I might describe them.

Caliprobola sorosis Will.

Williston described this species only from the male; characters for the female follows:

Female: From dull dark aeneous, yellowish above antennae, with whitish pollinose stripes along the eyes and with short brownish yellow pile.

Color of the legs, thorax, abdomen, and pile as in the male. Wings also the same. Fourth abdominal segment with a narrow, interrupted crossband. Length: Body about 11.5 mm., wing 9.5 mm.

Mr. Banks has loaned me a male and female; on the latter the above description of the female is based. Southern Pines, N. C., March 29, 1910 (A. H. Manee). The male is smaller and somewhat darker than the type specimen.

Caliprobola crawfordi, new species.

All the femora blackish, yellowish at tips and bases; the cross-vein joins the discal cell beyond the middle.

Male: Frons reddish brown or yellowish, silvery pollinose along sides. Antennae and arista reddish yellow; third joint nearly quadrate. Mesonotum and seutellum shining metallic bronze, with abundant yellow pile; meso-pleurae and sternopleurae same as dorsum of thorax, the other parts of the pleurae black and bare. Dorsum of abdomen the same color as dorsum of thorax, with opaque bands; second segment with two opaque bands, the first on anterior margin; third segment similar to the second; fourth entirely aeneous. Fore and middle femora entirely black except tips; hind femora black, yellow at tips and bases. Tibiae and first two tarsal joints of the front and middle legs yellow, the other tarsal joints blackish. Tibiae of hind legs reddish yellow with a little black; first two tarsal joints yellowish, the rest blackish. Wings infuscated, quite pale posteriorly. Anterior cross-veins joins diseal cell a short distance beyond the middle. Length: Body about 11.5-13 mm.; wing 10-11 mm.

Female: Frons blackish, reddish brown above antennae, and with short yellowish pile. Second and third abdominal segments banded as in male; fourth segment with a band on anterior margin, partly conecated by the overlapping of the third segment, and with a narrow interrupted band across the middle. Coxae of all the legs black, trochanters reddish yellow; bases and tips of femora of the front and middle legs yellow, the rest blackish. Femora of hind legs largely reddish brown, tibiae reddish yellow; the tarsal joints darkening posteriorly. Wings as in the male. Length: 11 mm.; wing 10 mm.

Seattle, Washington, May 15, 1898 (Male type, female allotype, J. M. Aldrich).

Type: Cat. No. 20289 U. S. N. M.

Described from six specimens; paratypes from Potlatch, Idaho, June 20, 1907, J. M. Aldrich Coll; and one specimen "Washington Territory." (This latter specimen was part of Williston's type material of *Brachypalpus pulcher*.)

This species is closely allied to Caliprobola sorosis Will. Additional characters that should aid in distinguishing them are as follows: In sorosis the spiracle below the humerus is surrounded

by short bright yellow pile, the wing bases are a deep yellow, the wing roots are reddish brown with short, yellow bristles and the base of the costa has short, bright vellow bristles.

In *crawfordi* the spiracle below the humerus is surrounded by short, brown pile, the wing bases are brownish yellow, the wing roots blackish, with short, black bristles and the bristles on the base of the costa are black and yellow.

Mr. Crawford has helped me considerably in working up the material of this group and it is with great pleasure that I name

this species in his honor.

Besides the above specimens the National Collection contains the following specimens of doubtful specific position: One female specimen from Lake Co., Cal., (D. W. Coquillett Coll.), which differs in having the frons yellow above the antennae, the pile on thorax and abdomen more golden and the wings lighter at base; another female from Kaslo, B. C., June 12, (R. P. Currie Coll) differs in having the third antennal joint obviously broader than long; the anterior cross vein joins the diseal cell at the middle and the hind femora are almost entirely vellowish red.

A REVIEW OF NORTH AMERICAN TORTOISE BEETLES.

(Chrysomelidae; Cassidinae.)

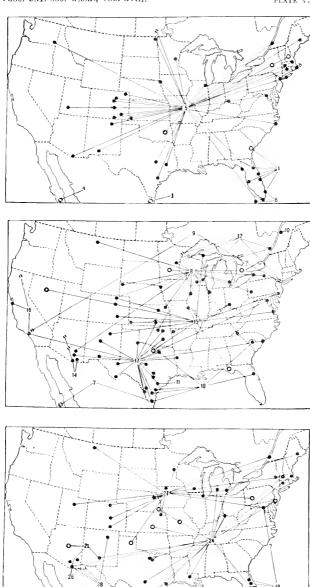
By H. S. Barber, Bureau of Entomology.

The writer recently rearranged the National Collection of North American species of cassidids according to the catalogue of this group by Spaeth 1914 (Junk's Coleopt. Catal., pt. 62) and was much surprised at the result, for the six genera and twenty species of the Henshaw list and supplement have now become sixteen genera and twenty-eight species with several additional subspecies, varieties and aberrations. Of our fauna as here treated five genera and eleven species are tropical, entering our southern limits at only one or two points, while two or three European species are reported to have become established; a few of the species listed below do not deserve continued space in our lists. Only seven of our species appear to be known exclusively from the United States and we have no genus peculiar to our fauna.

For our few species we have heretofore gotten along very well with but few genera. Yet when our forms, which are in reality only the northern fringe of a great tropical fauna, are studied in connection with their closest relatives of other regions, finer generic distinctions are demanded and new generic terms are forced upon the unwilling local collectors. Our own systematic literature is, as might be expected, comparatively meager and it is necessary for the student to consult foreign works which are available in but few entomological centers in America. The principal American papers are, Riley 1870 (2nd Ann. Rep. Nox. Ins. Missouri, pp. 56–64) who mentions eight species in five genera illustrating adults, pupae, larvae and an egg; Crotch 1873 (Proc. Acad. Nat. Sci. Phil. 1873, pp. 76–79) who treats eighteen species in five genera; and Blatchley 1910 (Coleop. of Indiana, pp. 1228–1233) who tabulates twelve species in four genera as occurring in his state.

Our ignorance of our fauna is perhaps most apparent when one spots the exact locality records of specimens before him on a base map, and begins to wonder at the enormous areas in which a certain species (or its close relatives) probably occurs but from which no material is available. No satisfactory way of indicating the overlapping distribution of a number of forms on a single map has been devised, but three maps are here introduced, from which it is hoped the reader may, with a little study, get a clearer idea of the distribution of most of the species than by much reading of locality records. A short explanation of their preparation is perhaps necessary to avoid mistaken deductions. Each locality has been found by the use of an atlas and spotted on the base map, numbering the spot according to the numerical position of the species in the appended list, circles being used to indicate inexact records such as state labels or localities which could not be exactly located. All spots bearing a certain number are then connected by straight lines to some central point where the number may be conspicuous, but the placing of these centers must be well considered to prevent their systems becoming too complex, and the reader must be warned against considering them as centers of dispersal. There is a limit to the possibilities of this, as of other methods, and to avoid confusion in the maps here given, certain of the common, widely-distributed species (Cassida bivittata, Chirida guttata and Metriona bicolor) have been omitted. To use the map the number assigned in this paper to the species sought for should be found, from which the radiating straight lines lead to all its localities as represented by specimens before the writer, localities mentioned in the literature being only rarely added.

The writer's specific concept is quite conservative, and as this has gradually come to be regarded as almost a term of reproach it may be pertinent to review our fundamentals. He regards systematics and nomenclature as a means and not an object, the success and only reasonable purpose of either being their usefulness to other students in any part of the world. Nomenclature is supposed to furnish the means of cataloging and correlating the biological or economic observations that are made by all work-



Locality records of Tortoise Beetles (Cassidinæ) in National Collection (for species numbers see pages 118 to 125.)

ers, and systematics supplies the means of identification of the objects upon which the observations have been made. Both are merely helps towards our understanding of the *living* forms, but most systematists seem to forget this and work as though the ultimate acceptance of their ideas would depend only on their particular, preserved specimens. A species, in the writer's opinion, is composed of a vast number of *living* individuals reproducing their kind from generation to generation, usually distributed over a rather large area and tending to differ more or less in the extremes of its range, according to environmental differences and to the migratory habits of its individuals before oviposition. An infinitesimally small sample of a species is preserved in all the collections in the world, and under existing conditions, no systematist can study very much of this sample.

It is probable that the confusion of forms mentioned below under *Metriona bicolor* is the direct result of the early description as distinct species of insufficient samples from widely separated local races, which not only blend in intermediate localities but attain greater divergence in localities then unknown. The only solution of such cases may be through such field studies and breeding projects as have been undertaken by Tower on *Leptino-*

tarsa.

Until material many times greater than that now available is at hand and is accompanied by biological data and specimens of immature stages, the writer thinks it unwise to argue about the specific, subspecific, varietal or aberrational status of the forms in such composite species as Chelymorpha cassidea, Physonota unipunetata, Jonthonota nigripes or Metriona bicolor. According to the standards of many workers he would probably be justified in proposing a dozen or two new names for forms that differ more or less in habitus, and further data on them might or might not justify this course but he prefers to await justification of such procedure than to anticipate it. The temptation to assume that our material comes from isolated colonies which therefore represent "species," "subspecies," "incipient species" "varieties" or whatever we are in the habit of calling them, is very great, and it may seem a duty to propose new names for them if possible. But when some other student of the group, whose locality records would fall in regions intermediate to the spots on our map, tries to apply such subdivision to his material, he is apt to experience serious trouble in deciding the affinities of his forms. The writer believes that most species are composites of separable units but that the piecemeal segregation of some of these units as "species" of the same rank as the original composite, complicates rather than simplifies future work. Usable subdivision of a recognized compound unit can only be done from a

very extensive study of a series of specimens from each of a large number of localities well distributed throughout its entire range.

The adoption of the recent generic combinations will be quite confusing at first and to aid American students who may have to use these names, a list of the species in their new form is appended. One generic name at least is improperly applied in Spaeth's catalogue and must be used in a different sense. Deloyala Redtenbacher 1858 (a subgenus of Cassida) is preoccupied by Chevrolat 1834 (Dejean Cat., p. 371 and "3rd ed." 1837, p. 395) who prepared the Chrysomelidae in the Dejean Catalogue and the species listed under this name in the earlier work include the names since designated as the types of at least three subsequent genera (Aspidomorpha Hope 1840, Chirida Chapuis 1875, and Metriona Weise 1896), the suppression of any one of which, would surely be resented by some. The best solution of the difficulty is to designate clarata Fabr. as type of Deloyola Chev., and leave the suppression of Metriona Weise, the last segregate (under which this species has been listed) to the judgment of others.

The genera established by Chevrolat 1834 in the Dejean Catalogue, seem to be entirely disregarded by Spaeth and their resurrection will cause increased annoyance the longer it is postponed.

The writer also objects strongly to the omission of one of our best-known and oldest specific names through what appears to be very faulty nomenclatorial selections. Cassida guttata Olivier 1790 (Enc. Meth. Ins. vol. 5, pp. 383-384) does not appear in Spaeth's catalogue except as we recognize it under the name Chirida signifera Herbst 1799, among whose synonyms we find "guttata Boh.—1855—(nec. Ol.1)." After a long search the writer believes he has found the reason for this omission to be that many workers have considered the species as founded in Olivier's second great work, 1808 (Ent., vol. 6, p. 956) which is antedated by Herbst's name. Champion 1894 (Biol. Cent.-Amer. Coleop., vol. 6, pt. 2, p. 195) believed he had Olivier's two original examples in the Banks cabinet (mentioned in 1808 work) and identified one with the Mexican Coptocycla extensa Boh. and the other with the oriental sexuuttata Boisd, 1835, designating the latter specimen as the true guttata Ol. Spaeth 1903 (Ann. Mus. Nat. Hung., vol. 1, p. 122) vigorously objects to Champion's findings for what seems to the writer to be untenable reasons, and says the name should be dropped "as a mixed name" (als Mischname). Apparently it is for this reason that he has omitted it in his catalogue in 1914. Unfortunately, neither of these authorities allude to Olivier's 1790 description, where no mention of the Banks cabinet is made and where the locality is given as North America instead of Tropical America as in his 1808 work.

Hoping to settle the question with some degree of finality the

writer sent specimens of our species to Mr. Lesne of the National Museum in Paris, explaining the above conditions, but in spite of his careful research he failed to find the original Olivier type. may be preserved elsewhere but there is little chance that it is other than our common mottled tortoise-beetle. found a specimen however, received at the Paris Museum in 1798 which is labelled "C. guttata Oliv." in an ancient handwriting not that of Olivier, and which he believes was probably determined by comparison with the type. This specimen was collected in Saint-Thomas W.I. by Mauge about 1797 and agrees well with a South Carolina specimen sent to Mr. Lesne for comparison, except in the size of the yellow spots. The writer believes therefore, that we must readopt *auttata* Oliv, and suppress *signifera* Hbst.

The economic literature contains much information about these beetles but has been, for the most part, neglected in preparing this paper. Those interested can find many references in the various parts of the Bibliography of Economic Entomology published by the Department of Agriculture, but as usual, care must be used in accepting the determinations.

The species reported from America north of Mexico are as follows, but certain of them should be dropped from our lists:

- 1. Porphyraspis cyanea (Say) occurs in Florida and Georgia. As the species develops exclusively upon palmetto, the locality Kentucky cited by Spaeth must be incorrect. Larvae found by Hubbard and Schwarz in May 1875 differ but little from the figures of the two species of this genus by Candéze 1861, and
- 2. Mesomphalia ephippium (Light), described from North America is believed to have been wrongly labelled (cf. Melsheimer Cat. 1853, p. 119) and has justly been omitted from our lists since 1853.
- 3. Mesomphalia chevrolati Boh. has appeared in our lists since Crotch 1874 and the only basis the writer has found for its inclusion is the allusions to the genus by Crotch 1873 (Proc. Acad. Nat. Sci. Phil., 1873, p. 76) and by Le Conte and Horn 1883 (Class. Coleop. N. A., p. 356). In the Spaeth catalogue the name appears as Pseudomesomphalia punicea var. chevrolati Boh. ing in its recorded distribution seems to warrant its continued appearance in our lists.

4. Hilarocassis exclamationis (Linn.) of the tropics from Brazil to the West Indies and Mexico is reported by Horn 1894 (Cal. Acad. Sci. (2), vol. 4, p. 344) from El Chinche, Lower Cali-

fornia.

5. Chelymorpha cassidea (Fabr.) is considered a composite of a number of local races, four of which (lewisi Cr., phytophagica Cr. 17-punctata Say and geniculata Boh.) are indicated in the Spaeth catalogue and occurs from Canada to Cuba and west to Winnipeg, Washington, Utah and Arizona. As is to be expected the forms differ in the extremes of their ranges, but probably no collection contains representative series from enough intermediate localities to justify a statement of their relationship. plants have been named for this beetle and its larvae: milkweed (Riley 1870, 2nd Rep. Nox. Ins. Mo., p. 58), wild morning-glory, raspberry, cabbage, plantain and corn (Lintner 1887, Cultivator and Country Gentl., vol. 52, p. 673), sweet potato, milkweed and wild morning-glory (Chittenden 1897, U. S. Dept. Agri. Div. Ins., Bull. 9 n. s., p. 23), strawberry vines (Webster and Mally 1898, U. S. Dept. Agr. Div. Ins., Bull. 17, n. s., p. 99), Solanum (Fall and Cockerell 1907, Trans. Amer. Ent. Soc., vol. 33, p. 200), "Convolvulus," "Asclepias" and sometimes raspberries (Chittenden 1910 in Smith's List Insects of New Jersey, Rep. N. J. State Mus. 1909, p. 356) but Mr. Knab tells me he believes that the only native host-plant is wild morning-glory, and explains the other records by the habit displayed by the full fed larva of migrating to other plants for pupation. Subspecies geniculata Boh. has been taken abundantly on a coarse convolvulaceous plant, Ipomoea biloba, at Marathon Key and Key West, Fla., by Knab, who informs me also, that the larvae differ from those of the Massachusetts form. Knab 1909 (Proc. Ent. Soc. Wash., vol. 11, p. 152) mentions the color changes between hibernating and sexually mature adults and alludes to a pale race found at Winnipeg.

6. Eurypepla jamaicensis (Linn.) was recorded by Schwarz 1904 (Proc. Ent. Soc. Wash., vol. 6, p. 7) as established at Key West, Fla. where it lived, as Boheman has already recorded, on the leaves of the "geiger tree," Cordia sebestana; and Dr. Chittenden has just received a specimen found on the same species of tree by S. H. Richmond at Cutler, Fla., July 1, 1915. E. brevilineata Boh. from Yucatan may not be distinct from this species.

7. Physonota alutacea Boh. is reported to range from Venezuela to our southern boundary. Horn 1884 (Cal. Acad. Sci. (2), vol. 4, p. 344) has reported var. cyrtodes Boh. from El Taste, Lower Cal. and Mr. Schaeffer has taken it in July at Brownsville, Tex. on Cordia boissieri and has kindly deposited an adult and two larvae in the National Collection.

8. Physonota unipunctata (Say) is variable, probably divisable into a number of more or less distinct forms which may be restricted to certain food-plants, but is distributed from Montreal and North Carolina to Montana and Arizona. The National

Collection contains, among other specimens, a series of a small form from Pine Ridge, Nebr. received from Prof. Bruner as feeding on Monarda, and two specimens of a large form, doubtfully belonging to this species, taken on Gaertneria xanthocarpa in the Santa Catalina Mts., Ariz. by Pierce. A specimen labelled Tucson, Ariz., sent me under the name picticollis Boh. by Mr. Schaeffer differs slightly in form from the two latter specimens although it is undoubtedly the same species, but all differ in habitus from a Guatemalan specimen of picticollis received from the Biologia collection. Popenoe 1877 (Trans. Kans. Acad. Sci., vol. 5, p. 36) records it on Vernonia while Walsh and Riley 1879 (Amer. Ent., vol. 2, p. 4) state that its larvae feed on Sonchus. Hamilton 1884 (Can. Ent., vol. 16, pp. 134-5) reports a form breeding on a mint Monarda fistulosa, at Allegheny, Pa. (which seems to be different from the Pine Ridge form on Monarda) and cities Randall's and Walsh and Riley's forms as breeding on Helianthus. Caulfield 1884, 1886 and 1887 (Can. Ent., vol. 16, p. 227; vol. 18, pp. 40-45; and vol. 19, pp. 73-76) gives three accounts of a form on Helianthus decapetalus near Montreal, and Hamilton 1886 (Can. Ent., vol. 18, p. 113) insists on the distinctness of unipunctata and 5-punctata. Knab 1909 (Proc. Ent. Soc. Wash., vol. 11, p. 151) reviews Caulfield's notes in regard to nuptial colors.

9. Cassida nebulosa. This European species is said to be destructive to cultivated beets and if the three records cited below are correct, it is strange that it has not received more attention in our literature. Horn 1894 (Ent. News, vol. 5, p. 146) records its capture by Bolter near the Santa Ana River in Southern California and Schaeffer 1901 and 1902 (Proc. N. Y. Ent. Soc., vol. 9, p. 94, and vol. 10, p. 170) mentions its occurrence at Suffern, N. Y.

10. Cassida rubiginosa Müll. The extensive synonymy in this genus has made recognition of forms by name very uncertain and our records of the capture of this species in America are mostly under the specific names *viridis* and *thoracica*. Three citations to its occurrence on burdock at Levis, Quebec are as follows: Fyles 1902 (Can. Ent., vol. 34, pp. 273–4), Roy 1902 (Nat. Can., vol. 29, pp. 145–149, figs. 1–6) and Fyles 1903 (Nat. Can., vol. 30, p. 22). Schaeffer 1903 and 1904 (Journ. N. Y. Ent. Soc., vol. 11, p. 113; vol. 12, p. 60 and p. 258) has mentioned the species on three occasions, on the last of which he gave the above name for the insect on the authority of Weise.

¹ These latter notes may, however, have been based upon the specimen herein mentioned under the name Cassida flaveola.

11. Cassida sp. (possibly panzeri?—Schwarz determ.). A single specimen somewhat resembling the last species is in the National Collection labelled "Victoria Tex. May 19, 1907 J. D. Mitchell" and the determination is given with much doubt. It is doubtless introduced and is not known to be established.

12. Cassida flaveola Thunb. Six American specimens of what appear to be this European species are before the writer from the following sources: Rigaud, Quebec, May 24, 1902, Chagnon (in National Collection from F. Knab) Suffern, N. Y. (Schaeffer Collection), Beaver Dam, Wis., Apr. 20, 1896 and Apr. 9, 1911, Snyder (the latter in the Dury Collection and the former in the National Collection), Duluth, Minn. (Fall Collection), and Mora, Minn., June 27, 1907, Vickery (in National Collection from F. Knab). The species is said to live in Europe upon certain "chickweeds," Stellaria holostea, S. graminea and Spergula arvensis. The specimen reported by Mannerheim 1853 (Bull. Naturforsch. Gesellsch. Moscou, vol. 26, p. 260) and cited by Hamilton 1894 (Trans. Amer. Ent. Soc., vol. 21, p. 32) under the name Cassida nobilis Linn. may possibly have been this species but their record is based upon a single specimen supposed to have been introduced on horticultural importations into Sitka, Alaska.

13. Cassida bivittata Say occurs from Massachusetts and Florida to Nebraska and Arizona but its locality records are omitted from the map. Riley 1870 (2nd Rep. Nox. Ins. Mo., pp. 57 and 61) illustrates and describes its biology but mentions only sweet-potato as its host-plant. Knab has collected the species on wild morning-glory at Springfield, Mass. It is remarkable that the toothed claws have not tempted someone to make a different generic assignment for this species.

14. Jonthonota mexicana (Champ.) has been recorded by Schaeffer 1905 (Sci. Bull. Mus. Brook. Inst., vol. 1, p. 173) from a single example on live oak in the Huachuca Mts., Ariz. and another single example from an unknown source is in the National Collection labelled Nogales. Mr. Schaeffer informs me that he also

has specimens from Prescott and Phoenix, Ariz.

15. Jonthonota nigripes (Oliv.) is another species apparently divisible into local races to which the correct application of the specific and varietal names are at present uncertain. The extremes of habitat of this complex are, according to labels on specimens before the writer, New Jersey, Florida, Michigan, Texas and Nevada, but the material is very insufficient. Riley 1870 (2nd Rep. Nox. Ins. Mo., p. 63) figured larva, pupa and

¹ Possibly the specimen upon which Schaeffer's records of Cassida nebulosa are based.

adult from sweet-potato in Missouri. Popenoe's 1878 (Trans. Kans. Acad. Sci., vol. 6, p. 84) allusion to Cassida sexpunctata as frequent on Ipomoea leptophylla in western Kansas may refer to this species or to the form mentioned here as possibly distinct from Metriona bicolor. Baker 1895 (Ent. News., vol. 6, p. 28) mentions larvae bred on Convolvulus saepium at Ft. Collins, Colo. and Cockerell 1903 (Ent. News, vol. 14, p. 207) records adults from Convolvulus incanus at Las Vegas, N. M., alluding to the species as a sweet-potato pest and citing his former reference (Bull. 35, N. M. Exp. Sta.). The Californian material is regarded as the following species.

16. Jonthonota novemmaculata (Mann.) is represented in the National Collection by a series from Los Angeles and San Francisco, Cal., taken by Koebele, but the species is omitted in the local list by Fall, 1901 (Occ. Papers Cal. Acad. Sci., vol. 8). A specimen from Dunsmuir, Cal. (H. C. Fall) loaned me by Mr. Schaeffer, seems to be intermediate between nigripes and this

species.

17. Gratiana pallidula (Boh.) (more familiar as Cassida texana) has been recorded by Riley 1882 and 1883 (Amer. Nat., vol. 16, p. 679, and vol. 17, p. 1070) on the leaves of Solanum elaeagnifolium in Texas and as injuring egg-plant on Wilmington Island near Savannah, Ga., citing also its capture on Solanum carolinense at Washington, D. C. Coquillet 1892 (Ins. Life, vol. 4, p. 262) records its occurrence on Solanum xanti near Los Angeles, Cal., this record being copied by Fall 1901 (Occ. Papers Cal. Acad. Sci., vol. 8, p. 160). The National Collection contains also a set found breeding on S. carolinense at Washington, D. C. about 1909, donated by Knab, and representatives from Kirkwood, Mo. (also on S. carolinense) Wellington, Kans., Tulsa, Okla., Mansfield, La., fourteen localities in Texas, Las Cruces and Albuquerque, N. M., and Santa Rita Mts., Ariz.

18. Orectis callosa (Boh.) from Texas (Dallas, Sharpsburg, San Diego, Corpus Christi and Brownsville) is labelled as found on *Solanum* and *Physalis*, and there are two slightly different specimens in the National Collection from Crescent City, Fla., collected by H. G. Hubbard. Mr. Knab has just donated a specimen from Swansea, S. C., taken Aug. 12, 1911, which is larger

than any of the others.

19. Coptocycla repudiata Suffr. 1868 (Archiv für Naturg., vol. 34, pp. 249–251—translated by Gundlach 1891 (?), Contrib.

¹ Somes' notes (Journ. Econ. Ent., vol. 9, 1916, p. 42) on his transference, in Missouri, of larvae of this beetle from colonies on *S. carolinense* to eaged plants of tomato and potato, and their successful development and reproduction on these plants, has since come to the writer's attention.

Ent. Cubana, vol. 3, p. 398), described from a single example sent by Dr. Gundlach in Cuba (exact locality unknown), has apparently not been recognized since, but a series of eleven specimens from Florida in the Hubbard and Schwarz Collection (Haw Creek June 10, Crescent City, Lake Poinsett May 1, and Cocoanut Grove May 24) agrees well with Suffrian's description, except that the specimens differ slightly from the description in the hind angles and margin of the thorax, and in the size. The size given, "Long. $1\frac{1}{2}$ "; Lat. 1"," is the same as that stated for Porphyraspis fallax, a specimen of which, in the National Collection measures 5 mm., while the specimens under consideration measure $5\frac{1}{2}$ to 6 mm. in length. The species is not congeneric with any other cassidid in our fauna, and not having been reported since its original description, still is listed under the genus Coptocycla, the type of which does not appear to have been fixed. An anomalous specimen from Piney Branch, D. C., May 27, 1906, collected by the late Mr. C. E. Burden seems very closely related to this species but may be distinct. Another specimen also from the vicinity of Washington (taken at Fourmile Run, Va., May 30, 1910 by Knab) is superficially very similar but has toothed instead of simple claws throughout. It is thought best to await more data before attempting to attach a name to either.

20. Chirida guttata (Oliv.) As stated above signifera Hbst. is antedated by Olivier's name and the available evidence indicates their synonymy. Spaeth's Catalogue includes under this name two subspecies and five aberrations bearing distinctive names, two of which are there proposed as new (pennsylvanica n. nov., for trabiata var. a Boh., and bohemani n. nov., for "guttata Boh. (nec Ol.)"). The pale variety is frequently confused with other species but is easily distinguished from all except extensa by the 3rd antennal joint being twice as long as the second and by the sharp carina on the outer edge of a narrow groove in which antennal joints 2, 3 and 4 lie when at rest. The species occurs from Massachusetts and Montana to South America but our locality records are not indicated on the accompanying maps. The forms of this variable species are worthy of an extended study on a very large scale but it may be well to call particular attention to subspecies lecontei.

21. Chirida guttata lecontei (Cr.) is so strikingly different in outline that, until sufficient evidence of its union with guttata is obtainable, the name should be given greater prominence. Of four specimens in the National Collection, one was collected by Morrison in Arizona, another from the same state came from the Belfrage Collection, the third is from Mesilla, N. M., July 15, 1897 (Cockerell) and the fourth is from the Huachuca Mts.,

Ariz., July 25, 1905 (Schaeffer). Another specimen is in the Dury Collection from the Santa Rita Mts., Ariz. July 1915. Three nearly similar specimens, but having a black venter, are from uncertain Mexican sources.

22. Chirida extensa Boh. I am indebted to Mr. Schaeffer for the identification of this species which had been confused among the pale specimens of *C. guttata*. Five specimens from Brownsville, Tex. are in the National Collection, three of which were taken June 9, 1895 by Mr. Schwarz, the other two having been received from Schaeffer.

23. Psalidonota leprosa (Boh.) or marmorata Champ. Seven specimens from Brownsville, and one from the Guadalupe River, Texas (Townsend, Wickham, Dury, Schaeffer and Mitchell, collectors) are smaller than our more tropical specimens of

leprosa but do not quite agree with marmorata.

24. Deloyala clavata (Fabr). As above stated this species is hereby chosen as the type of Chevrolat's long neglected genus, and this combination was used in the Melsheimer catalogue 1853, and by Riley 1870 and others, who allude to the species as an enemy of the white potato. Pierce has found the species in Texas, breeding on *Physalis cornuta* and Knab informs me that larvae and adults occur on both white potatoes and bitter-sweet (*Solanum dulcamara*) in Massachusetts. Dr. Chittenden has a specimen labelled "on *Solanum nigrum*, Glen Echo, Md." Specimens from Texas, New Mexico and Arizona are larger, paler and less tuberculate posteriorly but are not regarded as specifically distinct. They are believed to represent intergrades between our eastern form and the Central American testudinaria, but I am dissatisfied as to the strict application of Fabricius' name.

25. Metriona bicolor (Fabr.) This, familiar to most of us under the name Coptocycla aurichalcea, is apparently a composite of ill-expressed local forms distributed throughout the United States. Champion 1894 (Biol. Cent.-Amer. Coleop., vol. 6, pt. 2, p. 212) applies this name to a smaller and quite distinct form, varieties of which he admits merge with a series of varietal forms which he treats under the name trisignata and it seems certain to the writer that in Texas, these latter merge with the series of forms we have known as bicolor Fabr., aurichalcea Fabr., aurisplendens Mann, and marylandica Hbst, with which Champion thinks bis-tripunctata Hbst. may not be strictly synonymous. Until their status can be better determined, further nomenclatorial changes would be unwise. The localities for this ubiquitous species are not indicated on the appended maps. Riley 1870 (2nd Ann. Rep. Nox. Ins. Mo., p. 62, figs. 33 and 34) cites sweet-potato, morning-glory and bittersweet as hosts, but adults are found evidently at home on a large number of plants, and

breeding observations on colonies of larvae as well as adults are One of the better marked forms which is probably specifically distinct but which is assigned here awaiting more data, is more convex than the common form, has a narrower more decliyous and opaque expanded margin, usually displays one or three maculae on each elytron and has coarser elytral sculpture. Cincinnati specimen in the Dury collection was determined by Dr. Geo. Horn as C. bisignata Boh. but the description does not quite fit the series examined by me, the localities of which are, Chicopee and West Springfield, Mass. (Apr. 1884 and June 1898, Knab, 4 examples), Dayton, Ohio (July 22, 1905, Dury), Douglas Co., Kans. (Snow, 8 examples), Onaga, Kans. (Crevecoeur, 2 examples) and Texas (Belfrage). The anterior claw of the middle feet in the male lacks the basal tooth and is more strongly asymmetrical than in the other forms I have left under the name bicolor.

26. Metriona emarginata (Boh.) is recorded from Arizona but without definite locality indicated. Three specimens in the Knab collection were received from Schaeffer labelled Huachuca

Mts., Ariz., July 25, 1905.

27. Metriona purpurata (Boh.) represented in the National Collection by specimens from Maine to Montana, Utah and Texas, seems to have been neglected biologically, for no record of host plant is at hand, except that the writer is informed by Mr. Knab that it breeds on wild morning-glory in Massachusetts. A specimen of very different habitus, labelled "Fla., Coll. O. Dietz" is in the Schaeffer Collection. It is larger, more depressed and more highly colored than the northern specimens and if the locality is authentic it must represent a distinct local race which greatly extends the habitat of the species.

28. Metriona profligata (Boh.) has been cited by Schaeffer 1905 (Sci. Bull. Brook. Mus., vol. I, p. 174) from Arizona as occurring commonly on low weeds and branches of various trees. Specimens kindly given to the National Collection by him are labelled Huachuca Mts. June 16 and 27. Other specimens are from the Chiricahua and Santa Rita Mts., Arizona (May 20, June 13 and July 3, Hubbard and Schwarz) and Las Vegas Hot Springs,

N. M. (Aug. 11, 1901 Schwarz).

29. Ctenochira bonvouloiri (Boh). This Mexican species is mentioned by Horn 1894 (Proc. Cal. Acad. Sci. (2), vol. 4, p. 344) from two localities in Lower California and three examples are in the National Collection from Brownsville, Texas.

The following admittedly imperfect key to our species does not emphasize the recently proposed generic characters but is added in the hope that it will be of assistance to some who have not access to large collections or to better literature.

1.	Head visible from above, pronotal front margin straight or emarginate
2.	Head covered by the arcuate front margin of the pronotum
	Larger (10 mm. or more)
3,	Metallic green with red or yellow elytral spots (tropical)
	Red or yellow
	Red or yellow 4
4.	Elytra each with two narrow longitudinal black vittae. (Tropical)
	Hilaroeassis exelamationis
_	Elytra and pronotum spotted
5.	Claws simple
	Claws angularly dilated at base
c	Claws pectinate
υ.	
	expanded margins broad translucent, length about 10 mm. (Florida)
	Outline nearly continuous
7	Size larger (10 mm. or more), form elongate oval
٠.	Size smaller, form oval or circular
8	Elytra tumid. (Tropical)
٠.	Dorsum evenly rounded
9.	Form oval
-	Form more circular
10.	Form strongly convex, color red
	Form depressed
11.	Elytra unmarked, expanded elytral margins strongly descending
	(Florida)
	Elytra with infuscate markings
12.	Elytra obsoletely vittate. (Arizona)Jonthonota mexicana
	Elytra maculate
13.	Elytral margin opaque, spots less evident. (Middle States)
	Jonthonota nigripes
	Elytral margin translucent, spots more evident. (Pacific coast).
	Jonthonota 9-maculata
14.	Size large (9 mm.) dorsum gibbous, margins translueent (Brownsville,
	Texas)
	Oreetis callosa
15	Sculpture coarse, elytra usually tessellate, color reddish or yellowish 16
	Sculpture finer, elytra not costate, color green
16.	Size larger (8 mm.), elytral sculpture very coarse and reticulate
	Cassida nebulosa
	Size smaller (5 mm.), elytra coarsely punetate and subcostate
	Cassida flareola

17. More depressed, unicolorous. (Quebec)
More convex, sutural and scutellar region fuscous. (Texas)
Cassida panzeri (?)
18. Elytra with sutural and two lateral black vittaeCassida bivittata
Elytra not vittate
19. Depressed, pale, coarsely punctate
Convex, maculate or golden, punctures usually fine
20. Antennal joints 2, 3 and 4 lying at rest in groove whose outer edge is
produced into a sharp earina, 3rd joint twice as long as 2nd 21
No antennal groove, joint 3 but slightly longer than 2nd
21. Elytral margin black or clouded at humerus, elytra usually maculate
Elytral margin translucent at humerus, elytra usually immaculate
(Tropical)
22. Elytra gibbous, rugose and irregularly reticulate Deloyala clavata
Elytra smooth, evenly convex
23. Elyeral margin entirely translucent Metriona bicolor?
Elytral margin clouded opposite humeri
24. Transparent lateral area of expanded margin bordered internally with
narrow black band. (Arizona)
No black markings
25. Outline nearly circular, opaque part of elytra darker at sides, size
largerMetriona purpurata
Outline more elongate, color uniform, size smaller. (Arizona)
Metriona profligata
26. Outline nearly circular, disc with large black ring containing three
minute black points on yellow ground. (Tropical)

The following has been accepted for publication:

SOME AMERICAN HYMENOPTERA.

By J. C. Crawford.

Alcidamea colei, n. sp.

Male. Length about 5 mm. Black; head and thorax clothed with dense white pubescence; head closely strongly punctured, punctures separated by about a puncture width; on mesonotum the punctures similar, closer laterally and slightly sparser in middle; antennae short, brown, flagellar joints subquadrate, first slightly longer than broad, last slightly longer than first; wings almost hyaline, first and second cubital cells along radius subequal in length; legs dark brown, tarsi more reddish, pubescence on legs sparse, white; abdomen black, shiny, the apical margins broadly testaceous, margin of 6th segment including lateral teeth, almost colorless; segments 1–5 with apical bands of appressed white pubescence; 7th dorsal segment pointed at apex the produced portion hardly as long

as its width at base; first three segments sparsely finely punctured, segments 4-6 with punctures closer and somewhat coarser; second ventral with a transverse ridge the medial portion of which is triangularly elevated.

Described from one specimen from Redlands, Calif. F. R. Cole, collector.

Type: Cat. No. 20402, U. S. N. M.

This species has the apical segments of the abdomen shaped about as in *uvulalis*, *producta* and *pilosifrons*, all of which are much larger and more robust; *uvulalis* and *producta* have a great projection in the second ventral segment.

Protandrena bishoppi, n. sp.

Female. Length about 7 mm. Head and thorax black, abdomen with the three basal segments rufous, the following ones dark brown, segment one brown at base, segments two and three with a brown stripe near apex; face with the punctures rather coarse and not very close, those on clypeus somewhat larger and more scattered; the following parts yellow; dog's ear marks, supraclypeal area but this so deeply indented above as to make it almost two triangular marks, a median mark on clypeus not reaching apical margin, tubercles and front and middle tibiae at base; antennae dark brown; process of labrum smooth, truncate apically; mesonotum shiny, with sparse punctures; scutchum closely punctured, the punctures laterad large, punctures medially, finer and crowded; wings dusky, stigma and veins almost honey color; legs brown, the tibiae more reddish; the tarsi rufous; first abdominal segment shiny, sparsely, finely punctured, the punctures closer towards base, following segments closely punctured; depressed apical margins of segments with fine crowded punctures.

Described from one specimen from Hetty, Texas, July 10, 1904, F. C. Bishopp, collector.

Type: Cat. No. 20403, U. S. N. M.

Easily separated from heteromorpha Ckll. the other small species with light tarsi, by the truncate, non-carinate process of labrum, the scattered punctures of mesonotum and the rufous abdominal segments.

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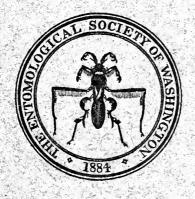
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THE

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PROCEEDINGS



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ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVIII

1916

No. 3

Two HUNDRED AND NINETY-THIRD MEETING,

March 2, 1916.

The 293d regular meeting of the Society was entertained by President C. R. Ely at the Saengerbund Hall, March 2, 1916. There were present Messrs. Baker, Borden, Böving, Craighead, Cushman, DeGryse, Ely, Fisher, Gahan, Greene, Heinrich, Holloway, Hopkins, Isely, Knab, Middleton, Pierce, Rohwer, Schwarz, Shannon, Snyder, Turner and Walton, members, and E. H. Gibson, H. G. Ingerson and A. T. Speare visitors.

The Corresponding-secretary announced the election of Mr. A. N. Caudell to the vacancy on the Executive Committee.

Dr. J. M. Aldrich, and Messrs. T. W. McGehee and R. W. Moreland were elected as corresponding members.

The following program was presented:

THE DETERMINATION OF THE ABDOMINAL AND THORACIC AREAS OF THE CERAMBYCID LARVAE AS BASED ON A STUDY OF THE MUSCLES.

By F. C. CRAIGHEAD.

INTRODUCTION.

The purpose of this paper is to establish a foundation for the subsequent description and classification of the North American cerambycid larvae (of which one part has already been published).²

129

Contribution from the Branch of Forest Insects, Bureau of Entomology,
 Craighead, F. C., Larvae of the Prioninae, Rept. No. 107, U. S. Dept.
 Agr., June 25, 1915.

In the following papers on these larvae the terminology given here will be adopted. From an anatomical study of the cerambycids alone, it was found inadvisable to draw conclusions, consequently the larvae of some eight or ten other Coleopterous families have been studied more or less thoroughly. The general areas as defined here have been found to conform very well, but as to the terminology of some parts and the importance or significance given to certain areas, this paper is provisional and will be followed by another discussing a series of larval types.

Before the 274th meeting of this society Dr. Adam Böving presented a paper on the abdominal structure of certain Coleopterous larvae as based on the muscular anatomy. This he stated was a continuation of Dr. Hopkins' study of the structure of the

scolvtid larvae.

The writer fully adopted this nomenclature in a paper on the larvae of the Prioninae² and found it adaptable to the abdominal structure which only was there discussed. But this paper in which a further study and correlation of both the abdominal and the thoracic structures of the cerambycid larvae is carried out, certain modifications of Dr. Böving's terminology are sug-

gested as more generally applicable.

Dr. Böving further mentions that he believes the characters which he describes can also be used for larvae of other family or ordinal rank. I can, in this connection, state that this has been found the case in several Coleopterous families (beside those here discussed) in which the anatomy has been studied. Especially applicable is his description of the intersegmental skin, the muscles from its cunea as well as the mechanical principles involved, in the whole arrangement of folds, areas and muscles pertaining to what he calls the lateral zone.

A study of the principle of the primary segmental divisions as represented by Dr. Hopkins³ in his study of the scolytid beetle, *Dendroctonus*, and the above discussed principle of Dr. Böving it is evident that these principles are identical, but that different terms have been used to designate the homologous areas. Thus Dr. Hopkins has shown that the pleurum is the main lateral region, divided into two pleurites, the epimeron and episternum of the adult, which he says are undoubtedly homologous to the epipleurum and hypopleurum of the larvae, and that between

² Craighead, F. C., Larvae of the Prioninae, Rept. No. 107, U. S. Dept. Agr., June 25, 1915.

³ Hopkins, A. D., Contribution Toward a Monograph of the Scolytid Beetles, Technical Series, No. 17, Part 1., U. S. Dept. Agr., 1911.

¹ Böving, A. G., On the Abdominal Structure of Certain Beetle Larvae of the Campodeiform Type. Proc. Entom. Soc. Wash., Vol. XVI, No. 2. June, 1914, p. 55-60.

these areas lies the pleural suture. This pleurum of Hopkins is homologous to the lateral zone of Böving, but the line which corresponds to his pleural suture in the adult is in the clerid and cerambycid larvæ a somewhat oblique line, less distinct than the sutures above and below the pleurum or lateral zone. Snodgrass¹ (page 537) has shown that in the nymphs and immature stages, that line is often indistinct, which corresponds to the pleural suture of the adults. This is considered the case in the clerid and cerambyeid larvæ.

Thus the principal changes in this paper will be to adopt the term pleurum for Dr. Böving's lateral zone, and for the prominent larval lines above and below pleurum (which Dr. Hopkins has not named) adopt Wallengreen² names of tergopleural³ and sternopleural suture for Dr. Böving's terms antipleural and pleural suture. Dr. Böying's name for hypopleurum (which name has been used as a part of pleurum) will have to be changed and the name postcoxal (PoCx) is here adopted. These are the principal alterations to be made in this paper to bring about a homology of the names and to adopt terms in more general use for areas which are here considered the same.

Above the pleurum is the tergum, its divisions are called tergites; below the pleurum is the sternum, its divisions are called sternites.

THE ABDOMINAL STRUCTURE.

The following discussion and figures are based on the anatomy of the cerambycids. Not all the muscles to be found in the seg-ments are illustrated, but the longitudinal muscles between the cumea are here omitted for the sake of clearness. One plate (Plate 9) shows these longitudinal abdominal muscles essentially like those of the clerid. These longitudinal muscles are attached to the posterior edge of one cunea extending to and attaching on the posterior edge of the cunea behind. The longitudinal muscles which extend backward determining folds within the segment, are always attached to the anterior edge of the cunea. Thus the cunea can always be defined by longitudinal muscles. Also the superior cunea can be indicated by the two fascia of the muscle s- pn^2 from the posterior cuneal notch. One fascia of this muscle attaches to the anterior and one to the posterior edge.

¹ Snodgrass, R. E., The Thorax of Insects and the Articulation of the Wings, Proc. U. S. Nat. Mus., Vol. 36, p. 511–595, 1909.

² Wallengreen, H., Physiologisch-Biologische Studien über Die Atmung Bei Den Arthropoden, Lunds Universitets Arsskrift, N. F., Vol. 10, 1914.

³ Dimmock, Geo., Primer Informe Anual de la Estacion Central Agromica de Cuba, 1906. On page 295, canal lateral, lateral furrow, is used, geniral but the grant design. equivalent to tergo-pleural.

Starting with an abdominal segment of a Lepturinae larva (Plate 6) the homologies will be pointed out comparing it with a clerid, as illustrated by Böving. First will be noticed a considerable reduction both in size and number of the perpendicular muscles, except those between the pleural sutures (tp-sp). This pleurum is strongly protuberant in this form, produced by the numerous short muscle bands from the tergopleural to the sternopleural (tp-sp) and postcoxal line [hypopleural line of Böving] (tp-pcx). These tergopleural-sternopleural muscles are absent in clerid forms as well as several fascia of the tergopleural-postcoxal muscles. The tergopleural suture is defined as in the clerid. by two sets of perpendicular muscles extending downward, one from its anterior extremity below spiracle to the posterior cuneal notch (tp-pn), the other from its posterior extremity to the postcoxal suture (tp-pcx). The sternopleural suture (s.p.) defined by three (in the clerid) large muscles, from its middle extending dorsad, is here represented by a single band of several fibres (pasc-sp). These last muscles define the ventral limit of the parascutum (PaSc) and the dorsal limit of the spiracular area (SpA) in the clerid. So do they also in the cerambycid. longitudinal band of muscles (e-s) attached along a perpendicular median line [the parascutal divisor (e)] on the lower half of the parascutum and upper half of spiracular area extends posteriorly to the superior cunea. These muscles seem to be of little value as determining any abdominal area. In the cerambycids this parascutal area extends over the back of the larvæ around a well defined plate, the scutum (Sc). The parascutum and the notal subdivisions are more or less protuberant forming the ambulatory ampulla. The writer believes the parascutum is nothing more than a portion of the notal areas as will be shown later in the thorax, but since it is of value for descriptive purposes the name should be retained. Of these notal divisions only the scutum (Sc) (or more correctly, the scutal plate) is well defined, first by two lateral sutures, the scutal lines (s.c.) defined by the large muscles (pn-sc), also by two transverse sutures (a.sc and p.sc) connecting the scutal lines, defined by muscles extending from the anterior line to the superior cunea behind the segment and from the posterior line to the superior cunea in front, on the same segment; also muscles from each of these lines extending in the opposite direction. These muscles defining scutum in the cerambycid and clerid cannot be absolutely homologized. the clerid, prescutum and postscutellum are defined by muscles s-pn ($s-pn^2$ of Cerambycidae) and pscl-hypl. These muscles

¹ l. c., Plates III and IV, figs. 1, 2, 3, 4.

have dropped further down in these forms and do not produce a fold defining these areas. Hence the region in front of scutum which is considered prescutum and that just behind scutum which is considered scutellum, are both indistinct. The post-scutellum is wanting.

Anteriorly beneath the sternopleural suture is a small triangle PrSt, which is considered the presternum. In most cerambycids it is formed more by the ampullar protuberance than by special muscles, and by this same protuberance crowded to the side. but in the thorax the ventral extremities often meet or fuse. In one subfamily, the Asemine, it is definied by a muscle ps-i [represented in the Cerambycinae figure (Plate 8)] and in the clerid and many other Coleoptera, it is well defined by two museles dpl-s and dpl-i (of Böving) one extending to the superior and one to the inferior cunea. In the clerid the deuteropleurite and presternum are considered as fused together. Behind the presternum and below the sterno pleural suture lies the postcoxal area (PoCx), limited below by the postcoxal line which is defined by (Böving's hypopleurum) perpendicular muscles (tp-pcx) (anti-hupl) of Böving) from the postcoxal line (p.cx) to the posterior end of the tergopleural suture; and I may add this postcoxal line is (in the cerambycids) also defined by one or several muscles (s-pcx) to the superior cunea (probably hypl-tepl of the clerid.) This postcoxal area is usually more or less triangular in shape. Beneath the postcoxal area lies the coxal lobe (CxL). This is a conspicuous area in some cerambycid larvae, lying between the postcoxal and sternal lines. It can always be determined by two points of muscular attachments. One on the sternal line having two or three muscles (tp-st) to the tergopleural suture, the posterior of which represents Böving's psclhupl; the other point is on the postcoxal line defined by the muscles tp-pcx (clerid muscles anti-hypt). From the position of these muscles in the clerid, figure 4, it will be seen that the coxal lobe is inconspicuous, the muscle almost lying on the same line, nevertheless a very small triangle can be seen on the larvæ. is almost the case in the Cerambycinae.

In the clerid just beneath the postcoxal and coxal areas lies the parasternum. The broken line ventrally limiting it is considered the sternal line defined by muscles s-st and an-st. This area is not present in the cerambycids and only the posterior part of the line defined by muscles pn-st (an-st of the clerid) is considered as really the sternal line. The other muscles s-st of the clerid are only present in Leptura forms (s-st). Their position in these larvæ and in many other Coleoptera is so variable that for the present their significance cannot be determined. However in the clerid, claterid and trogositid they define an

area which may well be called the parasternum for descriptive purposes. Between the sternal lines extends a transverse line, the eusterno-sternellar line (est.stl), separating the eusternum from the sternellum. In some larvae it is continuous with the sternal line, in others perpendicular to it, and probably more or less represents the same line, but for the sake of the discussion it is considered separately. It is defined by muscles to the posterior notch pn-est.stl. That part of eusternum extending dorsad to the sternopleural suture in front of the coxal lobe often becomes a separate area in the thorax.

All the ventral areas like the corresponding dorsal ones, are protuberant ventrally, forming the ampulla. Several muscles (*i-est*) extending from the eusternal region posteriorly to the inferior cunea and several (*i-stl*) from the sternellar region anteriorly to the inferior cunea are not considered as defining any definite areas or regions, but are of importance in contracting the

ampullæ and producing its bilobed form in many larvæ.

A comparison of two other types of larvae, the Cerambycinae and the Prioninae, with that of the Lepturinae shows that in both these forms the pleurum is not protuberant and only one of the short tergopleural-sternopleural muscles (tp-sp) is present. wise the tergopleural suture is very indistinct, especially in Cerambycinae forms. By the stress being removed from this suture and distributed more generally over the spiracular area the region around the spiracle has assumed on ellipitical form, lying partly in the pleural zone and partly in the spiracular area. to some extent acts as a substitute for the elastic effect of the pleural lobe which is very prominent in Leptura forms, indistinct on Prioninae larvae and still less evident on Cerambycinae types. Thus this tubercle or lobe becomes distinct or obsolete according to the position and strength of the sternopleural-tergopleural and other pleural muscles. In the last three abdominal segments of the Cerambycinac and Prioninae larvae the same development of pleural region and lobe is present as in all segments of the Leptura abdomen. Again in Prioninae the postcoxal line pushes downward shortening coxal lobe which is entirely lost in the Cerambycinae as the muscles indicate; those which define the postcoxal line (tp-pcx) and s-pcx having nearly the same attachment as those defining the coxal lobe. In the Cerambycinae the sternopleural suture is not defined anteriorly, thus presternum and pleurum are fused.

THE THORACIC STRUCTURE

The transition from the abdominal to the thoracic segments is a gradual one and can best be seen by comparing the integument from which all the muscles have been removed with another specimen with all the muscles in situ. First taking a prionine larva such a comparison will show that the anterior and posterior cuneal notches gradually separate as they approach the thorax. The former pushes dorsad, the latter ventrad. This produces a lengthening of the muscles $s-pn^2$ between them, together with a gradual reduction in the number of fibers until in the metathorax but two remain. Muscle band s-pn becomes more horizontal and in the first abdominal segment extends entirely across the segment (s-s-pn), to a point on the superior cunae. This muscle is retained in the thoracie segments. The muscle defining the scutal line (sc-pn) loses many fibers as it approaches the thorax and suddenly disappears in these segments. It is also absent in the abdomen of some other families.

Now if the integument free of muscles is studied it will be seen that between the cuneal wedges a gradual reduction of the connecting portion of the intersegmental skin (Is.S) takes place towards the thorax; so that between the metathorax and the first abdominal segment the anterior and posterior notches lie nearly in the same line, and the intervening skin is very short. These wedges and notches actually come into the same plane between the first and second, and second and third thoracic segments.

This construction necessarily prohibits the telescopic movements of the abdominal segments. The longitudinal muscles between these cunea are gradually collected and narrowed into a dorsal and ventral wedge-shaped band which becomes respectively the superior (s-rt) and inferior retractor (i-rt) muscles of the head. The dorsal are attached to a point at the fusion of the posterior limit of front and the epicranial halves, the ventral at the point of fusion of the collar of prothorax, and the hypostoma. Several other lateral longitudinal muscle bands (c-l) are attached to the collar or skin connection between head and prothorax around the occipital foramen.

With the widening movement of the cuneal notches the parascutal line is gradually lowered but the muscle (pasc-sp) which defines this line gradually, approaching the thorax, moves its attachment dorsally forward until it is attached in the thorax on the anterior notch of the superior cunea (s-sp). In some Cerambycinæ larvæ this muscle moves posteriorly upward and becomes attached to the cunea behind [see broken muscles of Cerambycinæ figure (Plate 8).] In some Asemiinæ it is attached along the scutal line and does not reach the cunea. Suddenly in the mesothorax the abdominal muscles from tergopleural suture to posteoxal area and coxal lobe or sternal line (tp-pcx, tp,st) have extended their dorsal attachment to the parascutal (now called scutal line). These muscles are collectively called

the wing leg muscles and their dorsal attachment marks the dorsal limit of alar area (A.A.) and the ventral limit of scutum. This alar area (so called because in abnormal larvae and also in the pupa the wing evaginates from this region) is triangular vith its apex pointing downward nearly bisecting the pleurum The sutures defining this apex are indicated by oblique muscles $(tp-pn^{1/2})$ one set extending forward to the posterior notch of the inferior cunea the other backward to a corresponding point behind. The anterior band $(tp-pn^1)$ evidently is the abdominal muscles, tp-pn. The posterior cannot be compared with any abdominal set in the cerambycids but occur in other This v-shaped suture below the alar area is considered the tergopleural (t,p) suture. The thoracic pleurum is usually divided into an anterior and posterior part by an oblique suture p.s. which is considered the pleural suture. It extends downward from the alar area and upward from the coxal lobe. It is much more prominent in some other larvae. The sternopleural suture retains its same relative position as in the abdomen. It is defined by two muscles from near its middle, one set s-sp already described, the other sc-sp, extends dorsad to the scutum representing abdominal muscle ty-sp. Thus the pleurum assumes a more or less crescent shape having its anterior portion truncated by the triangle bearing the spiracle while its posterior extends far dorsad. Across the alar area extends a band of muscles a-a, which may represent some modification of the abdominal band

In the Lepturinac and Priononae just in front and above the alar area is a small triangular lobe. It is formed by the wide points of attachments of the wing leg muscles and a shortening of some of the muscles a-a from their anterior attachment on the superior cunea. This (from its position) might belong to either alar area or scutum but is regarded as a part of the latter.

In the Cerambycinae it will be seen that the sternopleural suture is not complete anteriorly but merges with that line below it defining the posterior limit of presternum. Also the muscle s-sp often moves down along this line. Thus pleurum and presternum are not distinctly separated (a dotted line is indicated between them) which condition will later be remarked upon in discussing the prothorax.

It will be noticed that in the Cerambyeinae and Prioninae the abdominal spiracle lies in an elliptical region the lower part of which was before mentioned as part of the pleurum. Just in front of this ellipsoid is the intersegmental skin (Is.S.). Also in the abdomen one muscle (spi-pn) is attached to the spiracle itself, and often extends to the parascutal line. Several others (tp-pn) define the tergopleural suture just below it. Synchro-

nomously with the pushing down of the spiracular area to form the thoracic alar area, the muscles (tp-pn) have become strengthened and retain their same relative position $(tp-pn^1)$ but the spiracle has moved below the tergopleural suture as the muscle (spi-pn) shows, which moves with it. Thus the spiracle has moved into the pleural region. This muscle is small in the metathorax with the rudimentary spiracle, but large in the mesothorax. It is of great importance in deciding the segment to which the spiracle belongs when it has apparently moved from mesothorax to the prothorax, as in some Lamiinae and other larvae.

The rudiments of the lines defining the spiracular ellipsoid can still be seen in the metathorax (especially the Cerambyeinæ) but it is debatable whether to consider this region into which the spiracle has moved in the thorax as part of pleurun which it evidently was in the abdomen or to consider this spiracular triangle, as fused with the narrow piece of intersegmental skin and thus a part of it instead of the pleurum. In the mesothorax of Prioninae and Lepturinae this triangle is very sharply defined. For the sake of comparison in larvæ of other families the latter view is adopted, for the present, i.e., that the spiracle lies in the intersegmental skin of the pleurum. In another subfamily of cerambycids, Aseminae, the spiracle in the first abdominal segment has moved forward out of the ellipsoid past the line a.s.l. (Plate 8) into the intersegmental skin, thus giving more evidence for the latter theory.

To consider the formation of the notal subdivisions it may be well to start with the clerid in which form Dr. Böving has shown that the large muscle s-pn (attached very high) and the muscle pscl-hypl behind, cause elliptical constrictions, the prescutum and postscutellum. In the cerambyeid it has been shown that the postscutellum is absent. Now from the lowered attachment of the muscle s-pn² and greater protuberance of the ampullac with its many muscles, the preponderance of stress in this region is determined by the latter, forming curved lines as the limit of the parascutum. Therefore the presternum cannot take its triangular form. But in the thoracic segments, the muscles $s-pn^2$ have pushed their upper attachment dorsad and by the loss of the large muscles sc-pn a poorly developed ampulla results with the consequential forming of a triangular prescutum and Whether new sutures are formed in the thorax or the old ones modified is questionable, probably either alternative occurs in different forms of larvae. It is assumed as the muscles seem to indicate that the anterior and posterior sutures defining abdominal scutum a.sc and p.sc., have fused medianly and diverged laterally, thus opening scutum which fuses with parascutum to form what is collectively called in the thorax, scutum (Sc).

From this modification and that in other larvæ evidence is suggested that the abdominal parascutum is in fact scutum crossing the dorsal part of the segment, in the median dorsal part of which a more or less rectangular plate, the scutal plate, is often defined by muscles for mechanical purposes. This of course would only be true in those forms where prescutum and scutellum are absent or do not meet medianly. For when these are developed as in the thorax of cerambycids and the abdomen of clerids it more or less dorsally restricts the scutum, but still in some forms is not entirely divided. It is believed that these notal subdivisions in various larvae cannot be definately homologized by the muscles and that the transition from the abdomen to the thorax is brought about through different alterations in different larvae.

Just in front of the mesothoracic prescutum in Prioninae and Cerambycinae is found a narrow transverse fold (*Pn.F*) extending between the dorsal attachments of muscle *s-sp*. This fold is considered intersegmental skin, and as it is of value in descriptions is named the postnotal fold.

Beneath the anterior extremity sternopleural suture will be noticed a triangle with its apex extending ventrad. This is the presternum (PrSt) homologous to that of the abdomen. sometimes fuses medianly or has a median portion. posteriorly limiting it is defined by three muscles (p-cx) to the anterior dorsal point of coxal and by several muscles (p-i) extending backwards to the inferior cunea. Beneath the posterior half of the sternopleural suture lies the postcoxal area, (PoCx)surrounding the coxa. Its posterior ventral limit is weakly defined in the Prioninae but strongly so in the Lepturinae. in front of the coxa and behind the presternum the lateral extremity of the eusternum is constricted off in the Priorinae and Lepturinae. This constriction is called the precoxal area (P.Cx). In many larvae this area becomes strongly chitinized acting as a brace in front of the coxa corresponding to the postcoxal area These two areas dorsally surround the coxa and in the ceramlycids are usually fused and continuous but in many larvae are distinct and divided by a strong chitinization (often internally an appodeme). This fusion of the two areas is collectively called the epicoxal area (PCx+PoCx). The coxa is defined by four points, one dorsal more or less separating the precoxal and epicoxal areas, but having no muscle attachments, one posterior dorsad, one anterior ventral and one anterior dorsad. terior or often somewhat dorsal is defined by muscles, sc-cx, two diverging bands to the scutal line, and one tp-cx to the tergopleural suture. This point corresponds to that of the abdomen made by muscle tp-pcx on the postcoxal line. The anterior

ventral point is at the beginning of the eusterno-sternellar line and is defined by muscle sc-cx-st, to the scutal line, homologous to muscle tp-st of the abdomen. The anterior is defined by muscles p-cx, described before. From this lobe considered to be the coxa projects the trochanter which is moved by a muscle (sp-t) attached to its lower surface and to sternopleural suture. Thus that region in the abdomen called the coxal lobe can be shown to have developed the leg in the thorax. The eusterno-sternellar line extending between the coxa divides the eusternum (ESt) from the sternellum (Stl). Muscles (e-s-i) run anteriorly and posteriorly from it to the respective inferior cunea. The posterior of these may be considered as abdominal muscles pn-st and e-s-i. It will be seen that the abdominal muscles i-est and i-stl of the abdomen are retained in the thorax.

In the Lepturinae it was stated in discussing the abdomen that the coxal lobe was large and the postcoxal area relatively much smaller. In the thoracic segments the coxa is also correspondingly large so that in the prothorax they meet medianly. Also the postcoxal area is practically divided into an anterior and posterior half. In the Cerambycinae these coxae are still smaller, and the legs are often absent, corresponding to an indistinguishable abdominal coxal lobe. Parenthetically it might be remarked that the adults of Prioninae and Lepturinae are characterized by large conical coxae.

Again comparing the Cerambycinae it will be seen that the pleural suture of meso and metathorax does not extend forward to the inferior cunea but anteriorly the pleurum and presternum are fused. This corresponds to a similar modification in the prothorax where the pleural zone, presternum and eusternum are all fused, and the postcoxal area has been crowded back with the sternellum.

In the prothorax a lengthening of all the anterior regions has taken place to accommodate the attachments of the many muscles for moving the head. These muscles are not drawn but their prothoracic attachments are represented by dots in the figure. They occupy practically all the space not utilized by other muscles. These are all attached to the collar and none to the head proper except the inferior and superior retractor muscles. Likewise for mechanical reasons a solidification and chitinization of many of the areas has taken place. All the notal subdivisions above the alar area have been fused into the large rectangular pronotum (PN). In the Lepturinae this fusion often includes the alar area and is then spoken of as the protergum (PrTg). Beneath the pronotum, in turn, lies the alara area, the pleurum and epicoxal and precoxal areas surrounding the coxa. The muscles between these areas can readily be homolo-

gized with those of the other thoracic segments, and are lettered similarly. One muscle sc-cx-st from the lower limit of seutum to the ventral point of coxa has not been found in the prothorax. Anteriorly beneath the pleurum the presternum (PrSt) has become very large and extends entirely across the sternum. In Lepturinae it still consists of two lobes. Behind it and between the coxa lies the triangular eusternum. The anterior curved suture is defined by muscles (e-c) to the collar.

In the Cerambycinae some trouble may be experienced in homologizing the prothoracic areas below the alar area. As noted before the pleurum and presternum are partly fused in the meso and metathorax. This same fusion is evident anteriorly in the prothorax but posteriorly the pleural suture is usually impressed. (In some forms it is entirely absent or in others entirely present). The postcoxal area and small coxa have both been crowded back fusing with sternellum to form a narrow transverse fold. The point marked x on the sternopleural suture in the Prioninæ projects in an appodeme. Just above it extends two muscles to the pronotum and from it extends the muscle to the trochanter. At the inner point of the coxal lobe (xx) is a smaller appodeme. These two appodemes have become much extended and meet in a fine ligament inclined posteriorly over the coxa. Above this superior appodeme (x) extends the two muscles to protergum and from it the muscle to the leg, from the connecting ligament, extends the muscles p-i back to inferior cunea. family the proeusternum is rarely distinct.

The other subfamilies of the cerambycids, Aseminae, Lamiinae and Disteniinae can be easily homologized from the types which

have been described.

TECHNIC

In dissecting the muscles of these larvae the most essential factor is to be certain of the attachment of each muscle in relation to the others. Ordinarily pickled larvae are so contracted that this is difficult. A number of methods of preservation were tried but by far the most satisfactory found was to inject the living larvae with absolute alcohol. This distends the specimen, and (except in prepupal larvae) disintegrates the fat, also preserves the muscle in a tough, elastic condition. The alcohol is injected through the anus into the body cavity with a small hypodermic syringe. The pressure created inside closes the puncture when the needle is withdrawn. Specimens killed in boiling water plus a few drops of acetic acid, then injected with equal parts of 4 per cent formalin and 95 per cent alcohol, give good material from which the muscles can all be readily removed and the skin

showing the muscle attachments studied. Comparing such a skin and a specimen with the muscles intact gives a correct interpretation of their attachment and position.

EXPLANATION OF PLATES.

These plates were drawn by Miss Mary Carmody from sketches by the author. They are somewhat diagrammatic for the sake of clearness. In no segment are all the muscles drawn but are placed in two segments to avoid confusion. For the same reason several muscles are drawn with angles. The lettering is not present on every muscle on every plate but when not present it can be easily located on another plate where lettered. A few unimportant muscles are not shown in all the figures.

Capital letters represent areas; small letters separated by a dash represent muscles, by a period lines or sutures.

These figures were drawn from the internal right side of the larvae so that looking at the lines they will represent the external left side and the muscle can be imagined to be just beneath the skin on that side.

Plate VI. Lepturinae larvae (principally from Leptura nitens).

Plate VII. Prioninae larvae (principally from Orthosoma).

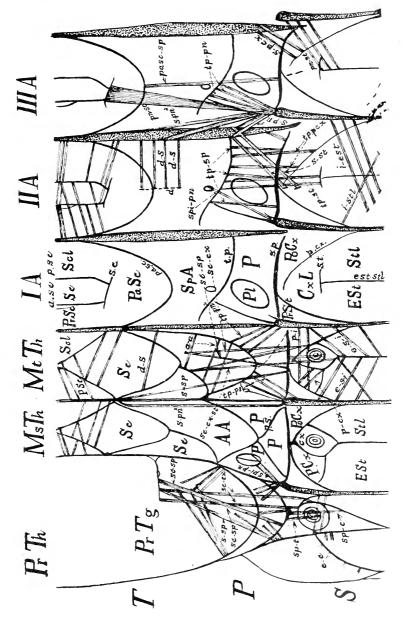
Plate VIII. Cerambycinae larvae (principally from Chion and Elaphidion).

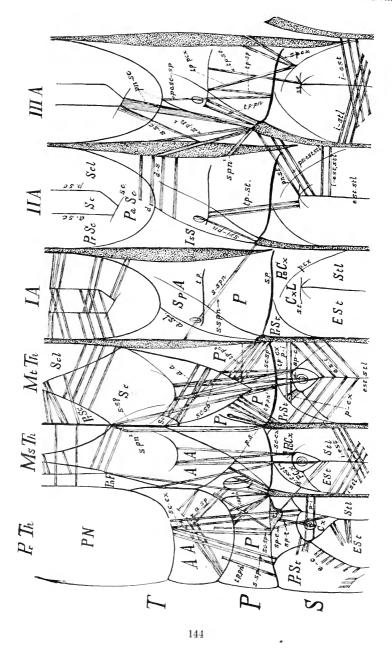
Plate IX. More important longitudinal muscles.

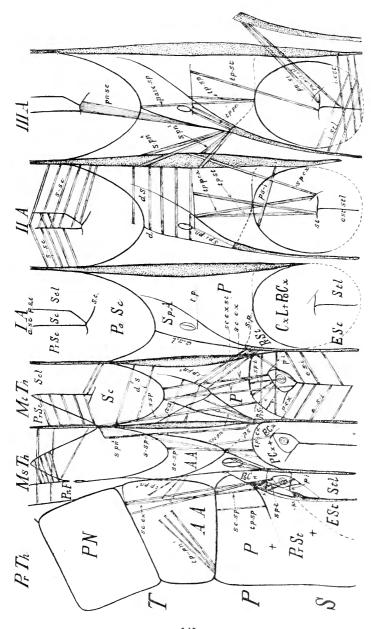
LETTERING ON PLATES.

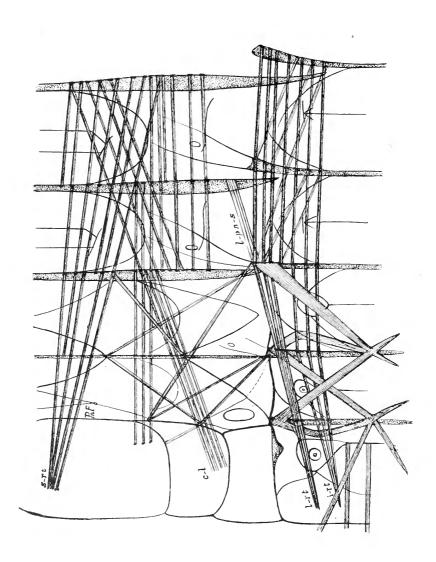
IA-first abdominal segment; IIA-second abdominal segment; IIIAthird abdominal segment: AA-alar area; a-a-muscles across alar area (thorax); a.sc—line forming anterior boundary of scutum or scutal plate; a.s.l.—line forming anterior boundary of spiracular ellipse; a-sp-muscle from mesothoracic spiracle to the center of the prothoracic alar area; c-l—longitudinal muscles from cunea to collar of head; Cx—coxa; d—parascutal divisor line; d-s—muscles from parascutal divisor to cunea behind; e-c-prothoracic muscles from eusternum to collar; e-s-i-sternal thoracic muscles from custerno-sternellar line to cumea in front and behind: ESteusternum est.stl-eusterno-sternellar line between eusternum and sternellum: i-est-muscles from central part of eusternum to cumea behind; i-est.stl—muscles from eusterno-sternellar line to inferior cunea behind; i-rt—inferior retractor muscle of the head; IsS—Intersegmental skin; i-stl-muscles from central part of sternellum to cunea in front; l-pn-slongitudinal abdominal muscles from posterior notch to superior cunea behind; MsTh-Mesothorax; MtTh-Metathorax; P-pleurum; PaScparascutal area; pa.sc—parascutal line bounding this area below; pasc-sp muscle from parascutal line to sternopleural suture, defining the ventral limit of parasentum and the dorsal of the spiracular area; PCx—precoxal area; p.cx-postcoxal line; p-cx-the muscle from posterior margin of presternum to coxa; p-i-muscles from posterior margin of presternum

to inferior cunea behind; Pl-pleural lobe; PN-pronotum; pn-cst.stlabdominal muscles from custerno-sternellar line to posterior notch behind; PnF—postnotal fold behind prothorax; pn-sc—muscles defining scutal plate or scutum from posterior notch to scutal line; pn-st-muscle from sternal line to posterior notch behind; PoCx-postcoxal area; PrSc-prescutum: PrSt—presternum; PrTq—protergum; PrTh—Prothorax; p.s pleural suture: p.se-line defining posterior boundary of scutal plate; ps-i—abdominal muscle from posterior line of prescutum to inferior cunea behind. This muscle is only present in one subfamily of Cerambycidae; S-sternum; Sc-scutum of thorax and scutal plate of abdomen; s.cscutal line, defining lateral limit of abdominal scutal plate and thoracic scutum. This line in the thorax is the same as the abdominal parascutal line; sc-cx-muscles from scutal line to posterior point of coxa; sc-cx-stmuscles from scutum to anterior ventral point of coxa near sternal line: Scl—scutellum; sc-sp—thoracic muscle from scutual line to sternopleural suture; s.p.—sternopleural suture; SpA—spiracular area; sp-c—prothorac muscle from sternopleural suture to ventral boundary of coxa; s-pcx muscles from post coxal line to superior cunea behind; spi-pn—muscles from posterior notch to spiracle; s-pn1—lower band of muscles from posterior notch to superior cunea in front; s-pn²—upper band of muscles from posterior noteli to superior cunea in front; sp-t—thoracic muscle from sternopleural suture to trochanter; s-rt—superior retractor muscles of head; s-sc—muscle of the Prioninge from the scutal line to superior cunea in front—also muscles from the anterior and posterior boundaries of scutal plate to superior cunea; 8-8p—thoracic muscle from sternopleural suture or occasionally posterior boundary of presternum line to superior cunea in front or rarely behind (Plate 8 dotted muscle); s-s-sp—first abdominal muscle from posterior notch of second segment across first to superior cunea—a continuation of muscle s-pn1, s-st—several muscles from superior cunea to a point in front of post coxal area. They may be considered as forming the anterior limit of this area or a continuation of sternal line as found in the clerids: s.t—sternal line perpendicular to eusternal-sternellar line; Stl—sternellum; T—tergum; t.p—tergopleural suture; tp-cx—muscle from tergopleural suture to posterior point of coxa; tp-pcx—muscle from tergopleural suture to postcoxal line; tp-pn—abdominal muscles from posterior notch to tergopleural suture; tp-pn¹—thoracic muscles homologous to tp-pn; tp-pn²—thoracie muscles on posterior half of segment from tergopleural suture to posterior notch. These two sets pull down the alar area; tp-sp-muscles between tergopleural and sternopleural sutures; tp-st-muscles from tergopleural suture to sternal line; xappodeme on sternopleural suture; xx—appodeme on custerno-sternellar line.









DESCRIPTIONS OF NEW NORTH AMERICAN MICROLEPIDOPTERA.

By August Busck.

Duvita, new genus.

Labial palpi long recurved; second joint thickened with smoothly applied scales, abruptly cut off at apex; terminal joint about as long as second joint, somewhat thickened with scales, smooth, acute. Antennae \(^3_4\), simple, basal joint without pecten. Forewings clongate ovate, apex bluntly pointed; 12 veins; 7 and 8 stalked to costa; rest separate; 2, 3, 4, and 5 equidistant, nearly parallel; 1b furcate at base. Hindwings nearly as broad as the forewings, trapezoidal, apex somewhat produced, termen slightly sinuated below apex; tornus rounded; 8 veins; 6 and 7 stalked; 3 and 4 connate; 5 parallel to 4; lower part of cell below the fold open.

Type; Duvita vitella Busck.

This genus is allied to Aproaerema Durrant, differing mainly in the shorter palpi with the sharply cut off second joint and the thickened terminal joint. Aproearema also has the apex of the hindwings much more produced and termen emarginate. Nigratomella Chambers and concinusella Chambers, hitherto placed in Aproaerema are referable to Duvita.

Conclusella Walker, hitherto placed in Gelechia, is also better placed in this genus, though it does not have veins 6 and 7 of hindwings as long stalked as the type of the genus.

Duvita vittella, new species.

Second joint of labial palpi blackish brown exteriorly, light ochreous fuscous on the inner side, with the edge of the abruptly cut off apex white; terminal joint whitish with a broad black annulation before the apex. Face whitish. Head and thorax whitish fuscous. Forewings light deerbrown with white markings strongly mottled with steelgray; basal half of costal edge dark brown; a broad ring of mottled white touching the base of the wing and the costal and dorsal margin encloses a spot of the ground color; from the middle of the costa runs an outwardly oblique white mottled fascia across the wing; this fascia is sharply defined toward the base of the wing, but is somewhat diffused exteriorly; from apical third of costa runs a parallel thin line of mottled white to tornus; a broad area of the same color along the terminal edge and including apex contains a conspicuous small deep black dash on the middle of termen; a thin black whiteedged marginal line at base of the steelgray white tipped cilia. Hindwings dark fuscous. Abdomen blackish fuscous above with ligher underside. Legs blackish brown with narrow white annulations on the tarsal joints. Alar expanse: 10-11 mm.

Habitat: Long Island, N. Y., Heinrick, coll.; Chevy Chase, Md. Hopkins, coll.; Piney Point, Md. Pergande, coll.

Type: Cat. No. 20206 U.S. N. M.

Bred by Mr. Heimick from stunted cones of Scotch and Austrian pine; by Mr. Pergande from cecid gall on *Pinus taeda*.

A pretty species, very similar in color and pattern to the well-known pine-needle miner *Paralechia pinifoliella* Chambers, but larger and without scale tufts and at once recognized by the black tornal dash.

Gnorimoschema chenopodiella, new species.

Second joint of labial palpi and brush exteriorly mottled with dark fuscous on ochreous ground color; inner side light ochreous: terminal joint dark fuscous with a faint broad ochreous annulation in the middle. Face light iridescent fuscous. Head and thorax dark fuscous. Forewings dark fuscous, faintly mottled with white, black and brown scales, the last most prominent on apical half of the wing and tending to form indistinct longitudinal brown lines; black scales form small illdefined spots on the cell and more prominently on costal edge just before apex; cilia ochreous fuscous. Hindwings light fuscous with light ochreous fuscous with narrow ochreous annulation at the joints. Alar expanse: 12–14 mm.

Habitat: Springfield, Mass.

Type: Cat. No. 20203, U. S. N. M.

Bred by Mr. H. E. Smith from pigweed.

A small inconspicuous species closely allied to G. artimisiella Kearfott and lavernella Chambers, but darker in color and less conspicuously mottled.

Gelechia puertella, new species.

Labial palpi long slender with small divided brush on second joint; light ochreous dusted with black. Head light ochreous; face with large central horny pointed prominence. Thorax light ochreous; base of patagia black. Forewings light ochreous, costa more or less dusted with black and with a black spot just beyond the middle; from this spot runs an indistinct darker ochreous shade across the wings, which at the end of the cell contains a small round black spot; on the middle of the cell is a larger black spot more or less connected with a similar spot on the fold below, which reaches to the dorsal edge; around the apical and terminal edges is a series of illdefined black spots. In some specimens the entire wing is more or less dusted with black scales; cilia light ochreous. Hindwings light fuscous with ochreous fuscous cilia. Abdomen light ochreous. Legs light ochreous with black annulations. Alar expanse: 18–20 mm.

Habitat: La Puerta, Cal.

Type: Cat. No. 20062, U. S. N. M.

An easily distinguished species of the group barnesiellae Busck and like this species with the horny prominence on the face, which presumably indicates that the species are internal feeders. Other closely allied species, G. variabilis Busck and texanella Chambers, do not possess this structure. The venation approaches that of Gnorimoschema with 6 and 7 of hindwings nearly parallel.

Gelechia paralogella, new species.

Second joint of labial palpi light ochreous above, with large, deep black, divided brush; terminal joint black with ochreous apex. Antennae black. Face pearly white, irridescent. Head and thorax black. Forewings blackish brown, nearly black; from the base below costa runs a short deep black line dotted with single-bright ochreous scales; an indistinct longitudinal row of black dots from the middle to beyond the end of the cell, each black dot edged exteriorly with a few light ochreous scales; a few similarly edged black dots on the fold. Cilia dark brown, dusted with white atoms. Hindwings light fuscous. Abdomen blackish brown. Legs black with ochreous annulations. Alar expanse: 17 mm.

Habitat: San Diego, Cal., W. S. Wright, collector.

Type: Cat. No. 20070, U. S. N. M.

Nearest to the eastern Gelechia trialbamaculella Chambers.

Gelechia diversella, new species.

Labial palpi long slender with short furrowed tuft on second joint: whitish fuscous mottled with black. Face and head light ochreous fuscous. Thorax darker fuscous. Forewings narrow, pointed; the whitish ground color is closely overlaid with reddish fuscous scales, which denote the general color of the insect; a large illdefined reddish brown spot on the cell; a similar spot at the end of the cell, above and below which is a black costal and dorsal spot; a small black streak on the fold; a series of illdefined black spots around the apical and terminal margin. Cilia light ochreous. Hindwings light fuscous with ochreous cilia. Abdomen ochreous fuscous. Legs with broad black annulations. Alar expanse: 15-17 mm.

Habitat: San Diego, Cal., W. S. Wright, collector.

Type: Cat. No. 20069, U. S. N. M.

Closely allied to Gelechia puertella Busck and barnesiella Busck, but smaller and without the facial horny prominence found in these species.

Gelechia notandella, new species.

Second joint of labial palpi with large divided brush, which becomes gradually shorter towards apex; white strongly mottled with black and brown scales; terminal joint white with black apex. Face light fuscous, iridescent white in center. Head and thorax light fuscous. Forewings dark fuscous, longitudinally streaked with whitish fuscous, except on

extreme tip of the wing which is unicolored, dark fuscous; just beyond the middle of the cell is a black spot and at the end of the cell is a similar spot, both are slightly edged with white scales so as to be indistinct ocellate; around the apical edge is a series of illdefined black dots. Cilia fuscous mixed with white. Hindwings dark fuscous with lighter ochreous fuscous cilia. Abdomen dark fuscous with two longitudinal black streaks on the under side. Legs blackish fuscous with narrow ochreous annuations at the end of the joints. Alar expanse: 24 mm.

Habitat: San Diego, Cal., W. S. Wright, collector.

Type: Cat. No. 20071, U. S. N. M.

A striking species allied to Gelechia biannulella Chambers, but larger and at once distinguished by the different labial brush.

Batrachedra mathesoni, new species.

Labial palpi vellowish with four conspicuous broad black bars on the outer side, two on second joint and two on third; inner side yellowish strongly mottled and suffused with black, especially on the third joint; extreme tip light, second joint nearly smooth with but slightly projecting scales at apex. Face light ochreous. Head light ochreous on the sides with a broad violaceous black central longitudinal streak, which is continued on thorax, which also has the sides and patagia ochreous. Antennæ light ochreous with narrow black annulations, and with two or three broad black annulations before the tip. Forewings light ochreous dusted with violaceous black especially below the fold; on the fold below the middle of the cell an alongate conspicuous black spot. Cilia yellowish fuscous. Hindwings linear dark fuscous with yellowish fuscous cilia. Abdomen dark fuscous above with vellowish underside; male genetalia vellowish; female with a short protruding horny, hairy ovipositor. Legs light ochreous, mottled with black exteriorly. Venation typical, 7 and 8 stalked, 7 to termen (These are the veins designated as 6 and 7 by Meyrick) Alar expanse: 10-15 mm.

Habitat: Cocoanut Grove, Fla.

Type: Cat. No. 20336, U. S. N. M.

Bred in long series from blossoms of Cocos nucifera received from Mr. H. M. Matheson, Cocoanut Grove, Fla.

The species appears to be the primary cause of considerable damage to the flower clusters and to seriously influence the crop of nuts.

The full grown larva is 8 mm. long; head and thoracic shield dark brown, nearly black; anal plate light brown; body whitish with faint and ill-defined purple, longitudinal lines. It spins a flimsy, white, oval, flattened cocoon; pupa light brown; pupa stage lasts from 5 to 7 days; imago issuing during latter part of May.

Olethreutes piceae, new species.

Labial palpi dusky white on the inner side, dark fuscous exteriorly. Face whitish fuscous. Head and thorax dark fuscous. Forewings blackish fuscous with a greenish tint and white transverse markings as follows: near base is a small diffused whitish area not clearly defined from the groundcolor; on the costal edge a five geminate white dashes, the first of which at basal third is continued into an undulating transverse fascia the next two dashes on and beyond the middle of costa are united by a similar white transverse undulating fascia, which forks just below costa. The outermost geminate dash is continued into an irregular and sometimes broken undulating fascia just within terminal edge, and this fascia has in some specimens the tendency to fork near the costa, the fork running to the penultimate geminate costal dash. Cilia fuscous with a black basal line along the edge of the wing, followed by a diffused white basal line.

Hindwings dark fuscous. Cilia fuscous with white tips and a white basal line. Abdomen dark fuscous with lighter underside and anal tuft. Legs blackish fuscous with narrow yellowish bars and tarsal annulations. Alar expanse: 13–16 mm.

Habitat: Colorado Springs, Colorado.

Type: Cat. No. 20337, U. S. N. M.

Bred during May and July in the Forest Insect Division from *Picea parvyana* and *Picea engelmanni*, collected by Messrs. J. H. Polloch and B. T Harvey.

The species is allied to O. fuscalbana Zeller and O. campestrana Zeller, but easily differentiated by the wing pattern.

Laspeyresia populana, new species.

Face and labial palpi light ochreous. Head ochreous with dark brown side tufts. Thorax blackish with posterior tip and the tips of patagia light ochreous. Forewings blackish brown with light ochreous markings; basal patch dark brown, sharply angulated outwardly and strongly mottled with ochreous on the dorsal edge; three large and three smaller ochreous geminate dashes occupy most of the costal edge; a large ochreous spot on the middle of dorsun; occllus indicated merely by a broad transverse bluish metallic streak before and after its normal place; a deep black marginal line around apex and termen is broken below apex by two short ochreous dashes and at tornus by two broad ochreous dashes; apical part of the wing finely irrorated with ochreous scales; cilia coppery brown. Hindwings light fuscous with whitish cilia. Abdomen dark fuscous with light ochreous underside. Legs light ochreous shaded externally with dark fuscous. Alar expanse: 13-14 mm,

Habitat: Missoula, Mont.

Foodplant: Popolus trichocarpa.

Type: Cat. No. 20338, U. S. N. M.

Reared by Mr. J. Brunner.

Allied to L. gallae-saliciana Riley, from which it is at once distinguished by the dark basal patch of the forewings.

Laspeyresia leucobasis, new species.

Labial palpi and face light ochreous gray. Head and thorax darker gray. Forewings with basal patch gray concolorous with thorax, outwardly angulated on the middle and edged by a broad transverse outwardly angulated ochreous white fascia, which is but slightly mottled with gray on the costal and dorsal edges; outer half of the wing dark brown with four pairs of short whitish ochreous costal streaks and two short whitish ochreous terminal streaks, one below the apex and the other above tornus; irregular interrupted transverse bluish metallic lines form an illdefined ocellus, which contains faint short black lines; on the fold adjoining the light transverse fascia is a large deep black illdefined spot and on the end of the cell is a round black spot. Cilia coppery brown. Hindwings blackish brown. Abdomen dark brown. Legs light ochreous brown with dark brown tarsal annulations. Alar expanse: 12–13 mm.

Habitat: Evaro and Missoula, Mont.

Foodplant: Larix occidentalis and Picea engelmanni.

Type: Cat. No. 20339, U. S. N. M.

Bred by Mr. J. Brunner from the former tree and by Mr. B. T. Harvey from *Picea*.

A very distinct species nearest to *L. tana* Kearfott, but differing in the light basal part and the much darker apical half; *L. tana* is also at once distinguished by the whitish cilia of the hindwings. *Laspeyresia fletcherana* is also closely allied, but is a lighter species, with the basal light part of the forewings much less sharply defined from the darker apical part of the wing.

Laspeyresia laricana, new species.

Labial palpi blackish fuscous. Face, head and thorax blackish fuscous. Forewings blackish fuscous with white and silvery transverse pattern and indistinctly dusted with light yellow scales; five white, geminate costal dashes; the first just before the middle, the second just beyond the middle and the three outer ones on apical third of costa; from the first of these geminate dashes runs an outwardly angulated, white, double fascia to the middle of dorsum, containing a narrow black central line and some metallic scales on the middle of the wing; from the second geminate spot runs a similar fascia, which, however, does not reach dorsum, but forms the inner edge of the ocellus; the lower part of this fascia is strongly overlaid with metallic scales; from the penultimate costal dash runs a broken irregular, metallic white transverse line along the outer side of the ocellus; this latter contains three parallel, longitudinal black lines; cilia dark bronzy with a black basal, marginal line. Hindwings and abdomen blackish fuscus. Alar expanse: 14-17 mm.

Habitat: Evaro, Mont.

Type: Cat. No. 20340, U. S. N. M.

Bred by Mr. Brunner from Larix occidentalis.

Argyresthia eugeniella, new species.

Labial palpi and face golden. Head white. Antennae dusky without darker annulation. Thorax white; patagia dark golden brown. Forewing dark golden brown with a violet sheen and with darker grown transverse reticulation; the dorsal part below the fold is white, slightly mottled with dark brown and with a large illdefined brown spot on the edge just beyond the middle; cilia dark brown at apex; whitish outside the white dorsal area. Hindwings light silvery fuscous with ochreous fuscous cilia. Abdomen dark fuscous with white underside. Legs golden with indistinct dark brown annulations at the joints. Venation typical: Veins 7 and 8 in the forewings stalked. Alar expanse: 7–8 mm.

Habitat: Key West, Fla.

Foodplant: Eugenia buxifolia.

Type: Cat. No. 20209, U. S. N. M.

Collected and bred by Mr. E. A. Schwarz in March 1912. The smallest described American species of the genus, very close to A. deletella Zeller, but smaller and darker in color. The white cocoon is double with an open network outer layer and a tough closely woven inner cocoon.

Argyresthia arceuthobiella, new species.

Labial palpi golden. Face silvery white. Antennæ golden with sharp black annulations. Tuft on head and thorax white; patagia golden yellow. Forewings golden yellow with a narrow leadcolored costal edge; a narrow longitudinal central white streak and a narrow white dorsal edge; apieal third of wing overlaid with leadcolored scales; cilia golden with silvery costal and dorsal tufts; extreme apex black, edged on both sides with white scales. Hindwings light silvery fuscous. Abdomen white. Legs white with dusky, faintly annulated tarsi. Alar expanse: 7 mm.

Habitat: Mistletoe, Oregon. Foodplant: Libocedrus decurrens. Type: Cat. No. 20208, U. S. N. M.

A very striking little species, reminding of the larger *Zelleria haimbachi* Busck in color and pattern. Venation typical: Forewings with veins 7 and 8 stalked.

Argyresthia libocedrella, new species.

Labial palpi, face and head light lemon yellow. Antennæ silvery white with blackish brown annulations and with basal joint golden. Thorax and forewings dark golden yellow with two conspicuous dark brown dorsal spots, one on the middle of the dorsal edge and one at the basal fourth;

faint traces of slightly darker lines crossing the wing from these dorsal spots can with difficulty be discerned in certain lights. Citia dark golden yellow. Hindwings light fuscous with ochreous fuscous cilia. Abdomen dark fuscous above golden yellow on the underside. Legs golden yellow. Venation typical: Forewings with 7 and 8 stalked. Alar expanse: 13–14 nm.

Habitat: Ashland, Ore., P. D. Serpent, eollector.

Type: Cat. No. 20114, U. S. N. M.

Bred from Incense Cedar, Libocedrus decurrens.

Nearest to the Eastern \hat{A} . alternatella Kearfott, but larger and deeper in color and without the conspicuous mottling of that species.

Argyresthia furcatella, new species.

Palpi, face, head and thorax white. Forewings white, sprinkled with dark brown transverse reticulations especially toward the apex; from the middle of the dorsum runs an illdefined outwardly oblique, dark brown fascia to beyond the end of the cell, but does not quite attain ccsta; on the fold between this and the base is a small round dark brown spot; a series of dark brown marginal spots begin on the middle of costa and reach round to tornus. Veins 7 and 8 stalked. Cilia dark ochreous fuscous. Hindwings ochreous fuscous. Abdomen silvery fuscous. Legs white with dark brown annulations at the tip of all the joints. Venation typical. Alar expanse: 12–13 mm.

Habitat: Cheyenne Canon, Colo. Type: Cat. No. 20207, U. S. N. M.

Bred by Mr. A. B. Champlain from cynipid gall on Oak.

Nearest to Argyresthia pedmontella Chambers and rileiella Busek, differing in details of ornamentation, especially by the presence of the round dark spot on the fold, and by having veins 7 and 8 in the forewings stalked.

ON THE TAXONOMIC VALUE OF SOME LARVAL CHARACTERS IN THE LEPIDOPTERA.¹

By Carl Heinrich, Specialist in Forest Lepidoptera.

It is not proposed in this paper to enter upon a discussion of all the characters that have been used to distinguish larvae, but merely to consider certain head characters which are particularly valuable for defining generic limits and determining immediate family relationships within the so-called Microlepidoptera.

¹ Contribution from the Division of Forest Insects, Bureau of Entomology.

In studying the head we find that while under different conditions of environment it assumes a multitude of different shapes and is variously modified in the proportionate development of its organs and parts, that such changes are frequently more superficial than fundamental. Certain characters still persist in their typical form through most of the changes. Even when there is a radical and fundamental alteration in structure due to the same environmental stimulus the forms differ in groups of different origin. The best examples of this are found among the leaf and bark mining larvae that have become adapted to sap-feeding (Comp. Tragardh (8)). The flat heads of all the Gracelariidae conform to one general family type while those of Phyllocnistis modified in the same organs and to the same purpose, exhibit a quite different form. Among the tissue feeding miners the differences are also striking. Ectoedemia and Opostega, for example, inhabit flat serpentine mines and have the head similarly depressed but differ in fundamental structure.

The generic and larger group characters of the head are found in the shape and proportions of the head capsules, the character of the frons, the setae and the trophi. Color and color markings are at most of specific importance. Very often they vary in individuals, or in different stages of the same larva. The shape and intensity of pigmentation in the ocellar area is also variable, being often unevenly distributed on opposite sides of the same

head.

HEAD CAPSULE.

The general shape of the head capsule is a character that must be used with considerable caution. By itself and unsupported by other characters it is worthless in many groups. In certain specialized families and subfamilies it is diagnostic. The rounded, caudally-extended and widely separated blade-like dorsal hind margins of the epicranium are typical of the Nepticulidæ. Mnemonica and Dorata have projections resembling these but much longer, differently shaped and closer at the extremities. horse-shoe shaped head of *Tischeria* and the wedge-like heads of the flat gracilariids are characteristic. On the other hand, the free-feeding Micros have much the same type of head. for example, little or nothing in the general shape to distinguish a gelechiid from a tortricid or a phycid. Taken together with other characters, however, peculiarities of shape are significant and constant within a genus. The general shape and proportions of the head capsule should be noted in larval descriptions. In our joint paper (7) on A. strigifinitella, Fr. DeGryse and the writer have designated the line of greatest width as the norm of comparison in expressing proportions of the head capsule. This is a purely arbitrary method but it has the advantage that, by stating where the greatest width lies and then defining other dimensions in its terms, one is able to describe the shape and proportions in brief formula.

THE FRONS.

The shape and dimensions of the frons and its adfrontal margins are characters of greater value and have been extensively used by Dvar in his numerous descriptions, and by both Forbes (5) and Fracker (6) in their diagnosis of families. The frons and adfrons are usually treated as separate sclerites. In reality from and adfrom are, as has been shown by Dampf (2), one piece, the only suture being between the adfrons and epicranium, the line marking the division of frons and adfrons being merely an infolding. The extent of this infolding varies considerably in different forms. In the normal head of free-feeding larvae the external portion of the adfrons is appreciable, and narrowly borders the frons, the greater portion being folded in to form a strong chitinous, caudally pointed arch within the head. The points (Plate X, fig. 1) where the frontal margins begin to converge sharply to make the V-like line, indicate the attachment of the tentorial arms. sap-feeding larvae the frons is considerably widened and extends back to the vertex of the head with little or no narrowing. these forms the infolding is greatly reduced and the adfrontal margins absent. The points of attachment of the tentorial arms are thrust correspondingly far back with a bridge between them, connecting the dorsal hind margins of the epicranium. Mnemonica [Comp. Busek and Boring (1)], on the other hand, there is but a slight infolding to mark the lines of a rather normal from, and little or no reduction of the sclerite, the adfrontal margins being extended until they form a half circle covering a greater part of the anterior dorsal surface of the head capsule. skeletal modifications are necessitated by the environment and biology of the larvae. Their degree would indicate therefor, the extent to which any particular form had developed to meet a given condition, but in spite of the fact that a similar biology will produce similar modifications, the different fundamental form of the head structure remains distinguishable.

A Cameraria and a Phyllocnistis rise to practically the same level of development from different starting places. Their environment has caused similar modifications, but the type form

There is an internal cause for certain changes in the frontal sclerite as well as the external one of alteration to accommodate the larva to any particular mining habit, and that is the increase or decrease of muscular tension at their points of attachment.

The frons, with its strong infoldings, forms a bridge supporting the head against the thrust of the mandibles and the pull of the strong adductor mandibular muscles attached to the infolded portions of the epicranium forming the adfrontal suture (the straight line of the Y). In the forms which have only to tear delicate leaf-tissue to get the sap nourishment, and also in those nibbling the thin surface cuticle of the leaf, there is much less muscular tension and consequently less need of a strong buttress between mandible thrust and its muscle pull. Hence the frontal surface area is widened and the depth of the infolded adfrons proportionally reduced. When considered in comparison with the line of the epicranial suture and the character of the mandible, the proportions of the frons are good taxonomic characters. We find the shortest from, the heaviest infolding of the adfrons, the longest epicranial suture associated with strongest mandibles, possessed by the larvae which feed on the edges of the tougher and more fibrous leaves. In the biologically diversified Micro group these structures indicate generic and larger divisions.

THE SETAE.

The setae of the epicranium are considered by Dampf of even more significance than the body setae and to him belongs the credit of giving them proper place in larval descriptions. Dyar in 1896 (4) designated a set of Roman numerals to distinguish the eleven primaries visible from the dorsal side of the head, numbering them from the hind margins forward.

Forbes and Fracker have used these numerals in their references to head setae. Dampf (2), however, has shown that the setae form natural groups within certain areas and has named these groups after the areas upon which they are found. He counts as primaries besides the eleven given by Dyar and Forbes, one seta in the ocellar region, two on the hind part of the gena, and several, generally unhaired tubercles, or "punctures." His system with slight alterations and the addition of a set of symbols to designate the individual seta, is the one adopted here. The following table shows the homology of the system proposed with Dyar's numerals.

In my opinion the 3rd seta described by Dampf among his Dorsolaterals (Dyar's II) does not properly belong there, but should be associated with the small seta near the epicranial suture (Dampf's "vertical" seta), the unhaired tubercle or tubercles between them and the several secondary setae or punctures near the dorsal hind margins. They form a natural and easily distinguished group from the others and, considered apart, give a clearer understanding of the differing setae arrangements. I have

Homology of Epicranial Setae.

AREAS	SETAE	
	Ad-1	ıx
Anterodorsal	Ad-2.	VIII
	Ad-2a (puncture)	
	Ad-3	IV
Ocellar	0-1	
	1a (puncture)	
	0-2	V
	O-3	VII
	80-1	XI
	SO-2	VI
Subocellar	SO-2a (puncture)	
	Oo-3	Z
	L-1	III
Lateral.	L-1a (puncture)	
	Pd-1.	II
	Pd-1a (puncture)	
Posterodorsal.	Pd-2	1
	Pd-2a (puncture)	
	Numerous secondary punctures	
	(1-1	
Genal	G-1a (puncture)	

designated them as the Posterodorsal group, and the 3 forward setae and puncture as the Anterodorsal group. I also place the most lateral of Dampf's Dorso-laterals (Dyar's III) and the puncture (L-la) on the side of the head near it, in a group by themselves, calling them the lateral group. I think this is justified by the "migration" of the group, which is of great significance; for the approximate distance of L-1 from Ad-3, (as compared with distances separating the different Anterodorsals) in heads superficially alike (tortricid, gelechiid, or oecophorid), not only aids in the separation of such groups, but indicates a different scheme of head development in this particular region. In studying the heads of the Cossidae it was also found that there is a distinct chitinization marking the areas of Anterodorsal, Ocellar and Subocellar groups. That the Lateral seta and puncture fall

behind this chitinization is added indication that they do not be-

long with the Anterodorsals.

The practically constant proportional differences in length of the epicranial setae in all but the most specialized leaf-mining species coupled with their arrangement into easily definable groups, make it possible for us to homologize the setae and to correlate even the most trifling differences in their positions.

An important fact which is not brought out by Dampf, is that changes in position of the setae are due to modifications by growth or contraction of the chitinous areas upon which they occur. This is shown by the fact that the setae of any given group always remain in that group, and by the relative position of the groups themselves under obviously different and easily recognized changes For example, where there is an enlargement in the head areas. of the head surface there is not a corresponding spreading out of all the head setae, but only of those comprising the Posterodorsal group. We find also in several normally round heads (among most of the free-feeding Micros) a crowding forward of the setae, indicating an enlargement of the posterior part of the head at the expense of the frontal area. The most numerous changes in fact are due to modifications of the epicranium back of the area occupied by the Anterodorsal, Ocellar and Subocellar setae. And consequently, changes in the relative position of the Posterodorsal and Lateral setae are more frequent and striking than among the other groups. In the round feeding larvae of the Lithocolletinae, however, the development is more in the opposite direction, the Anterodorsal, Ocellar, and Subocellar areas are larger in proportion to the Posterodorsal, and there is a consequent spreading out of the setae of the former, the Lateral group is thrust further back and the Posterodorsal group is restricted to a smaller area.

All changes, however, are not confined to group movements. There are also differences in the relative position of the setae within a given group, chiefly differences in distance, but also, among the Anterodorsals especially, in the alignment of the setae. In both the most striking changes are noted among the genera of any given family, but here again we find certain tendencies which aid in the identification of larger groups; for example, Ad-2 and Ad-3 are rather closely approximate in Stenomidae or Oecophoridae, and in the Tortricoidea the three Anterodorsal setae form a very obtuse triangle often, in fact, lying in almost a straight line with L-1, while in other families their alignment tends more to-

wards a right angle.

The positions of the punctures appear at first hand much less constant within families than those of the setae, and offer greater difficulties, for they are often invisible except under the highest power of a compound microscope. Ad-2a revolves almost completely around seta Ad-2 in the Gelechiidae, and Pd-2a is equally migratory in many groups. I have found, however, no very striking differences among species of the same genus and within families even the tendencies of migration are limited in certain directions. It is never a serious problem to homologize these punctures. The one I have designated as Pd-la offers the most difficulty on account of its frequent proximity to L-1 and Ad-3. That it really belongs with the Posterodorsals and indicates the development of that group is shown in *Gnorrimoschema* and *Nealyda* where it is closely approximate to Pd-2a, lying almost midway between the two primary Posterodorsal setae.

Changes in position of setae and punctures within the setae groups in any given family are most frequent with Ad-2, Ad-2a, O-1, Pd-la and Pd-2a and less frequent with Ad-3, L-la, O-2, and 3, and the Posterodorsal and Subocellar setae. In fact, no group is so nearly uniform in the arrangement and the position of its individual setae throughout the Micros as the Subocellar group.

The secondary tubercles of the Posterodorsal area vary greatly in number and character. In many cases they differ on the two epicranial lobes of the same head and are frequently undistinguishable even under high magnification.

THE TROPHI.

Among the trophi we find our best characters on the labrum and the so-called maxillulae and in the arrangement of the ocelli. On its upper surface the labrum bears twelve primary setae arranged in two symmetrically paired groups of three each (Fig. 1). The outer three are always located upon the area represented on the ventral side of the labrum by the epipharyngial rods (Fig. 2). The development of these rods determining the relative position of the setae, the foremost seta being always at the front extrem-These three setae also have a common nerve connection near the base of the labrum. The three medial setae also form a natural group with separate nerve connections from the laterals. As Forbes' (5) numbering of these setae contradicts their morphology I am proposing the symbols M 1-2-3- for the medial group and L 1-2-3- for the lateral, numbering from the base of the labrum forward. The punctures are treated as subprimaries of the medial group. Fig. 1 shows the homology with Forbes'

¹ Dampf's division of the setae within and below the area occupied by the ocelli into two groups is a convenient one for purposes of description and identification but the name occllar and subocellar are somewhat misleading as 0.1 often falls well below the ocelli and SO-2 as frequently within the ocellar area.

numerals. Changes in the larum itself, especially the depth of the median incision, have much to do with alterations in the relative position of the setae, particularly those of the medial group, but in spite of this a characteristic alignment prevails in certain families regardless of the shape of the labrum. This is well illustrated in the Gracilariidae where the arrangement shown in Fig. 1 persists even through the flat stages and in spite of the most radical alterations in the form of the labrum itself. The more common grouping among the Micros is with M-2 laterad and slightly back of M-1.

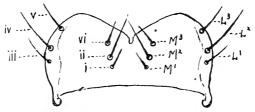


Fig. I Dorsal view of a Micro Labrum (Family Gracilariidae) M-1, M-2, M-3—Medial setae; L-1, L-2, L-3—Lateral setae (Roman numerals show Forbes' numbering of the setae).

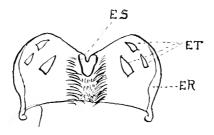
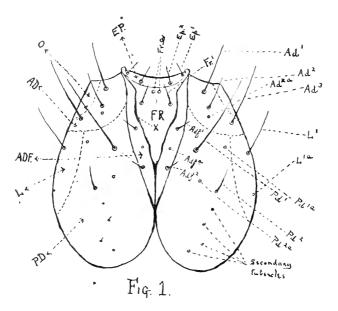
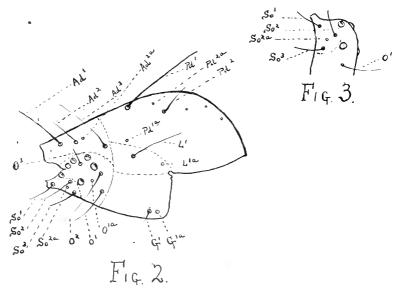


Fig. 2 Epipharynx of a Micro Larva; ER—Epipharyngeal Rod; ES—Epipharyngeal Shield; ET—Epipharyngeal Setae.

Among the Micros the general alignment of the two groups is at least of family significance while slight differences in proportionate distances between setae, and differences in the relative position of the individual setae are of generic value.

Besides the dorsal setae there are two other characters of importance on the labrum; the chitinized epipharyngeal shield in the notch and three pairs of modified setae near the anterior-lateral margin. The shield itself is often quite variable in different species of the same genus and only seems to be generally consistent in the leaf-miners. The epipharyngeal setae are so





uniform throughout the order that it is hard to see and more difficult to describe their differences in different groups. They are mainly differences in length and in shape. In the Gracilariidae they are like saw teeth, tapering sharply and broad at the base. In some of the gelechiids they are wider in the middle. In *Mnemonica* they look like flat plates bluntly pointed at each end. That they are really flattened setae and not plates or "sensory cones" is realized from a study of them in *Gelechia cercericella* and *G. gossypiella* where their tubercle-like sockets are quite plain.

Since the publication of Fr. DeGryse's paper on the "maxillulae" we have been able to study these organs in several more forms and in all where the plates are developed it is easy to identify genera by this character. One can place a species of Parectopa, of Gracilaria, or Ornix, or Cremastobombycia, or Ectoedemia in its proper genus by the labial parts of the larva alone. In Ectoedemia there are slight differences between the species but they do not obscure the generic character. The maxillulae however, are extremely difficult to describe in such a way as to convey as accurate an idea of their structure, and for that reason will probably not be as useful in tables or keys. To be really intelligible they must be drawn.

The ocelli are more easily handled and as Fracker observes (6) offer valuable characters for the determination of genera. Occasionally (as in Sesiidae and Tineidae) their arrangement is sufficient to fix the family of a larva whose other body and head characters have been obliterated; but normally they are useful more as supplementary than diagnostic characters and should always be considered in connection with the setae associated with them.

The setae are after all the best guide to a study of larval origin and development, showing not only the extent of separation between species through environment, but their affinities as well by the manner in which each has reacted to the stimulus.

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EXPLANATION OF PLATE X.

(Schematic drawings).

- Fig. 1. Dorsal view of Head Capsule showing a typical Micro arrangement of setae and punctures. EP.—Epistoma; Ep-1, Ep-2—Epistomal setae; FR—Frons; Fr-1.Fr-a—Frontal setae and punctures; ADF—Adfrontal area of Frons; Adf-1, Adf-2, Adf-a—Adfrontal setae and puncture. X—Bend indicating forward attachment of Tenitorial Arms. O—Ocellar area of Epicranium; AD—Anterodorsal area of Epicranium; Ad-1, Ad-2, Ad-2a, Ad-3—Seta and puncture of Enterodorsal area. L—Lateral area of Epicranium; L-1, L-1a—Lateral seta and puncture; PD—Posterodorsal area of Epicranium; Pd-1, Pd-1a, Pd-2, Pd-2a—Posterodorsal seta and punctures.
- Fig. 2. Side view of same head showing all Epicranial areas, setae, and punctures. Areas marked by dotted lines. The following seta are not indicated in figure 1: O-1, O1a, O-2, O-3—Setae and puncture of Ocellar area; So-1, So-2, So-2a, So-3—Setae and puncture of Subocellar area; G-1, G-1a—Genal seta and puncture.
- Fig. 3 Anterior ventral view of left Epieranial lobe showing typical arrangement of Seta *O-1* and the Subocellar group.

THE HYPERMETAMORPHISM OF THE LEPIDOPTEROUS SAPFEEDERS.

By Rev. J. J. DeGryse, Staunton, Va.

The habits and the structure of lepidopterous sapfeeding larvae have for many years attracted the attention of Entomologists. Excellent studies on these subjects were published by Chambers, Dimmock, Chapman and more recently by Trägardh. The transformations of the sapfeeding larvae strikingly exemplify the effects of environmental influences, of changes in habit and consequent use and disuse of organs. In their order of appearance they constitute a noteworthy exception to the famous "recapit-

ulation" theories. For detailed study the reader is referred to the able dissertations of the above mentioned authors. A synopsis of the most salient features in the development of these larvae will suffice for our present purpose.

To obtain their food, the sapfeeders burrow in leaves, stems, or By means of a narrow slit they separate the epidermis from the parenchyma and thus cause a flow of the plantsaps. This habit necessarily involves profound structural modifications. The head-capsule takes the form of a wedge. The mandibles are flattened into thin blades with small teeth and a serrate cutting edge. Becoming greatly enlarged, the hypopharnyx forms an ideal receptacle for the flowing saps. The spinneret is either absent or so greatly reduced as to be functionless. In some cases, the labial palps appear to be missing whilst in others they are merely rudimentary. The maxillary palps are very incon-It is readily seen why all these appendages of the lower lip should undergo such reduction. Their presence in the normal form would indeed prove very cumbersome to the larva in the making of its peculiar mine. The body also undergoes a general flattening and becomes moniliform. Legs and prolegs are rudimentary or absent.

The sapfeeding habit is a very high specialization and must be considered as a comparatively recent acquisition in the Lepidoptera. It has been found only in two families, the Phyllocnistidae and the Gracilariidae. There is, however, a great difference in this respect between the two families. As far as we know, the Phyllocnistidae feed on plantsaps exclusively throughout their whole larval existence. Such is not the case in the Gracilariidae. Here we have every indication of a gradual evolution tending to establish the sapfeeding habit as yet not fully acquired in many genera. In their early instars all gracilariids are sapfeeders and present as such the typical form induced by this habit. The larvae of many genera become external feeders or tissue feeding leafminers in their later instars. On changing their habit they change their form and return to the normal type of lepidopterous larvae. This return occurs at different periods of Thus, Gracilaria and Ornix have only two flat instars. Acrocercops strigifinitella has two and a partial one. Phyllonorycter has three. With Marmara and Cameraria, on the other hand, the sapfeeding habit persists throughout the entire feeding period. That the early stages should specialize rather than the later ones is in itself a most remarkable feature. Chapman calls especial attention to this fact and advances the theory that "There is a tendency of a peculiarity acquired at any stage to be passed to the preceding or following stage. Hence that the young

larva is just as liable to specialize in view of changed conditions as the adult one is." Dr. Chapman is of the opinion that where the sapfeeding habit has actually been acquired in two or three instars only, it will not continue to encroach on later instars. His idea that "Any larval instar may undergo changes without necessarily involving any other instar" may be true generally speaking, but in the Gracilariidae, in as far as the sapfeeding habit is concerned, it does not seem to hold, if any significance is to be attached to the existence of intermediate forms. Thus, Acrocercops strigifinitella, in its third instar has the head and mouthparts practically normal, but the body is absolutely legless. In the socalled round stages of Parectopa, Phyllonorycter, Cremastobombycia and Porphyrosela a marked tendency towards the flat type is exhibited in the shape of the head-capsule. To justify his contention, Dr. Chapman found it convenient to consider each larval molt as "A separate stage of development, as distinct as is the larva state from the pupa." This radical departure from all accepted views seems unnecessary. There is a real subdivision of the larval life of the sapfeeders into distinct supernumerary stages, but it is established on other grounds. The most important modification induced by sapfeeding, consists in the atrophy of the spinning apparatus. Whenever the habit persists throughout the entire feeding period, this atrophy necessitates a special stage, in which by a regeneration of the spinning organs the larva is enabled to construct its cocoon. The spinning stage is as highly specialized as the feeding stage. The spinneret is now the organ "par excellence." In most cases maxillary and labial palps are also highly developed. As the larva never feeds in this stage, the mandibles become reduced. In nearly all cases, this reduction produces the complete inability to leave the mine for pupation. Various degrees of advancement in this direction may be observed. Marmara has flat functioning mandibles which cross each other like the blades of a pair of scissors. They are used by the larva to cut its way through the epidermis of the foodplant when leaving the mine and also to perforate the outer layers of its cocoon to adorn it with characteristic globules in the manner observed and described by Mr. Busck. Cameraria has the mandibles of a normal tissue-feeding larva, but they are much reduced and so placed as to be functionless. The mandibles of an unidentified phyllocnistid (?) erroneously described as the larva of Metriochroa are merely small, shapeless chitinizations. The mandibles of Paullocnistis seem to be completely lost. In Phyllochistidae and Gracilariidae we thus find a series of molts so specialized as to accomplish ultimately the complete separation in time of two vital functions of the larva, namely that of feeding

and that of spinning the cocoon. We think, therefore, that this series of molts, whenever it occurs, should be considered as a distinct hypermetamorphic stage. In other words the flat sapfeeding type should be accorded the same rank of distinction as that attributed, in the Meloidae for instance, to the campodeiform larva. The cases are, of course, not strictly parallel. The triungulin owes its present existence to the preservation of a primitive form, whilst the sapfeeding larval type is the effect of the preponderance of a new form developed at the expense of a preexisting type. But the preservation of the primitive form in Meolidae is due to biological factors of the same nature as those tending to establish the new modification in Gracilariidae. assertions are based especially on recent studies of the transformations of the genus Marmara. Between the feeding and spinning stages of this genus there is a period of quiescence. period, it was found, is marked by a special stage similar to the pseudo-pupal stage of the Meloidae. This intermediate stage is coarctate throughout its existence. Shortly before the complete transformation of the spinning larva, the larval heads of the pseudo-pupal and spinning stages may be seen enclosed within the skin of the last feeding stage. Upon emergence, the last larva easts the skins of both preceding stages at the same time. pseudo-pupa bears the same relation to the prepupal larva as the pupa bears to the imago. It is, essentially, a stage of disintegration and reconstruction of tissues incidental to the profound alterations in the organs of the larva. All appendages are merely outlined in the external pellicle, nevertheless, the parts are distinct and are easily homologized. The characters of the feeding type are lost, those of the spinning type are foreshadowed, especially in the labrum and labium. The maxillae and mandibles exhibit in their general appearance a more distinct return to the form of the primitive Gracilariid larva. This applies also, in a measure, to the general outline of the head-capsule. Only few data concerning the duration of the pseudo-pupal stage have been obtained. One specimen of Marmara fulgidella was observed on April 19 and 20 of this year. Feeding stopped on April 19 about 3 p.m. The larva remained motionless for several hours. The heart-action was regular and occasionally there was a slight jerking of the mandibles. About 8 p.m. the heart-action was considerably slower and the larva was opening and closing its mandibles vigorously. At 12 p.m. the heart-action had stopped almost completely and the larva appeared to be dying. On April 20 at 8 p.m. the pseudopupa was well developed, the only sign of life was a slow pulsation in the region of the ninth abdominal segment. The larva remained in the same condition until 11

a.m. after which observations had to be discontinued. A more detailed study of this state will be the subject of a future paper.

The full significance of the pseudo-pupa remains shrouded in mystery. A superficial inquiry into the developmental history of Cameraria failed to reveal the existence of any such intermediate stage. Whatever the case may be in Cameraria or in Phyllocnistis, our present knowledge of the metamorphosis of Marmara sufficiently warrants the sharp line of distinction to be drawn between the early sapfeeding stages and the later normal or spinning stages in all Gracilariidae and Phyllocnistidae.

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Two Hundred and Ninety-Fourth Meeting, April 6, 1916.

The 294th regular meeting of the Society was entertained by Mr. E. A. Schwarz at the Saengerbund Hall, April 6, 1916. There were present Messrs, Abbott, Back, Baker, Barber, Böving, Caudell, Crawford, Cushman, Duckett, Ely, Fisher, Gahan, Garner, Greene, Hutchison, Isely, Knab, McIndoo, Middleton, Paine, Pierce, Popenoe, Quaintance, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Snyder, Speare, and Townsend, members; and Robert Fouts, visitor.

The corresponding-secretary announced that the Executive Committee had voted to raise the price for single numbers of the Proceedings from \$.50 per number, the present price, to \$.75 per number.

The corresponding-secretary also announced the death of Mr. Theodore Pergande, a former member of the Society, and stated

that a committee consisting of Messrs, Howard, Schwarz and Barber had been appointed to prepare a biographical sketch for the Proceedings.

Dr. A. T. Speare and Mr. H. L. Viereck were elected active members.

The following program was presented:

PRISTOCERA ARMIFERA (SAY) PARASITIC ON LIMONIUS AGONUS (SAY).

By J. A. Hyslop, Bureau of Entomology.

References to the rearing of parasitic Hymenoptera from Elateridae are very rare in Entomological literature. In 1860 Curtis¹ recorded the rearing of a Proctrotrupes from an elaterid larva in England, and in 1898 Dr. S. A. Forbes² mentions rearing a parasitic fly (?) from an elaterid larva. The writer has recorded the finding of a *Tiphia* like cocoon with an elaterid skin firmly woven into it from which the adult parasite had emerged. And Mr. J. J. Davis has made an identical observation in Indiana.

Late in July, 1915 the writer investigated a serious wireworm infested region near Brattleboro, Vermont. Limonius agonus (Say) was doing very serious damage to corn in the narrow valleys in this region, especially in the more poorly drained fields. While digging in one of these fields, a larva was found which was at first thought to have been disemboweled in digging. On closer examination, however, it was found to have a Hymenopterous larva firmly affixed to its ventral surface. The wireworm was still alive and quite active, although the parasite was nearly onethird as long as its host and quite as stout. The host was about six inches below the surface of the ground and about eighteen inches from the nearest corn hill. The wireworms had for the most part ceased feeding in this field. This host and its parasite with several other wireworms was placed in a tin box filled with moist sphagnum moss and brought into the Laboratory. Three days later the box was examined and all but one wireworm besides the host removed. On the following day the parasite abandoned its original host, which it had reduced to a mere empty skin, and attached itself to the ventral surface of the other wireworm in the same cage. The parasitic fixed itself to the host by

Curtis, John, Farm Insects, p. 181, 1860.
 Forbes, Dr. S. A., Ill. Agri. Exp. Sta. Bul. No. 44, p. 228, 1896.
 U. S. D. A. Bull. 156, p. 29, 1915.

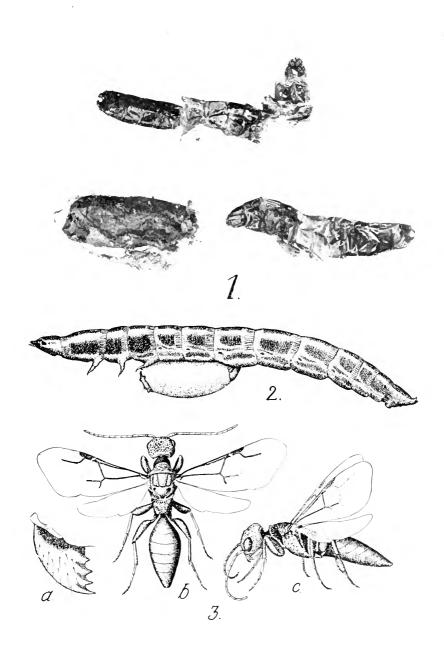
inserting the mouthparts in the sternum of the third abdominal segment and lay appressed to the ventron of the host with the head directed caudad (Plate 11, fig. 2). That the parasite was actively feeding was evidenced by the rhythmic pulsations of its The parasite larva was 5 mm. long and 2 mm, in diameter. nearly cylindrical and glaborous; the head was pale buff and the body translucent with many floculent bodies visible through the transparent skin. The lateral trachae were very distinctly vis-On the terminal dorsal segment was an irregular shield of rugose lemon yellow skin bearing two short hairs. A more detailed description was impossible on account of the danger of injuring the parasite by exposure to light and air. On July 29, six days after finding the larva in the field, the parasite left its second host, which it had entirely consumed except a small amount of tissue in the anterior end and the skin. It spun a silken cocoon (Plate 11, fig. 1) on the surface of the soil in the rearing cage. In texture this cocoon was tough and leathery, very much like that of Myzina (Elis) 5-cincta (Fab), with some loose strands of silk thrown irregularly about it. When first spun, this cocoon was a rich reddish brown, but in the course of a couple of days it assumed a light tan color. The cocoon is cylindrical and somewhat truncate at each end, measuring 9 mm. long and 3.5 mm. in diameter. On August 30, thirty-three days after spinming its cocoon, the adult parasite emerged and was determined by Mr. S. A. Rohwer as Pristocera armifera (Say) ♂ (Plate 11, fig. 3). This insect belongs to the Bethylidae, an aberrant group of vespoids formerly classed with the Proctrotrypoidea. The descriptions of the male and female by Ashmead are to be found in Bull. U. S. Nat. Mus. 45, p. 34, 1893.

The adult emerged by gnawing an irregular circular hole in one end of the cocoon. It did not cut off a little cap, as do many Hymenopterous adults on emerging, but reduced the material from the opening to very fine fragments. It returned to the cocoon whenever exposed to the bright light, evidently for concealment, and is very likely nocturnal in its habits.

EXPLANATION OF PLATE XI.

Fig. 1. Pristocera armifera (Say) cocoon and remains of two host larvae. Fig. 2. Limonius agonus (Say) larva with mature larva of Pristocera armifera (Say) in feeding position.

Fig. 3. Pristocera armifera (Say) adult ♂ dorsal and lateral aspect.





NOTES ON THE LARVAE OF EUXESTA NOTATA WIED.

By R. H. Hutchison, Bureau of Entomology.

Regular periodic collections of common Diptera were made on the experiment farm at Bethesda, Md. beginning about April 1, The adults of Euxesta notata Wied. (Ortalidae) were first taken on April 30, and were seen during May, June, and July, but were very rare during August and September. never taken in or around horse stables nor accumulations of horse They did, however, frequent pig pens and piles of pig These accumulations were made up largely of manure nearby. bran and other wastes from the feed troughs, as well as of dung. In fact, the bran usually exceeded the actual amount of dung, and the whole mixture was very moist and in an active state of fermentation Large numbers of the larvae of this species were found in this bran-manure mixture during June and July. were also found in moist bran alone. One June 9 two wire basket maggot traps were started, one containing about one bushel of fresh horse manure, and the other an equal quantity of bran well moistened. The larvae of Euxesta notata were first taken from the bran trap on June 21, and continued to appear until July 1. None were taken from the horse manure under the same conditions. On August 25, a similar maggot trap experiment was started using fresh horse manure on one, and bran-pig manure mixture in the other. Daily collections of the larvae were made until the third week in September, but no larvae of this species were taken at this season of the year, although they had been found breeding abundantly on the bran-manure mixture during

Larvae of this species selected on June 25 were put in a breeding jar with some moist bran which had been previously examined to make sure that no other larvae were present. They pupated during the next day or two and adults emerged between July 3 and 8. I am indebted to Mr. Knab for the determination of the adults. The following description of the full grown, third stage maggot is made from a study of alcoholic specimens taken both from bran and from the bran-manure mixture.

Larva. (Plate XII, fig. 1.) Average length about 7 mm. Pseudocephalon bilobed, each lobe bearing two small papillae. Two comparatively large mandibular hooks, the tips of which are visible on the exterior when in repose. Each mandibular sclerite shows a small opening in its broadest part near the base, and on the dorsal side is a distinct recurved spur. Two hypostomal sclerites, which are long and rod like, somewhat widely separated and diverging slightly posteriorly where they fit into deep incisions in the lateral plates. They are more heavily chitinized at the anterior

ends. The pharyngeal sclerites or lateral plates are not heavily chitinized, light brown in color and fading out in certain areas to a rather translucent membrane. Longitudinal folds evident in the ventral wall. (Plate I, figs. 2 and 3.)

Anterior spiracles 10 lobed. Twelve visible body segments. Lateral fusiform areas from the 6th to the 12th segments, rather faint and not spiniferous. Ventral fusiform areas present from the 5th to the 12th segments. These pads bear rows of minute close set spinules (Plate I, fig. 4), and the arrangement of these rows varies slightly from pad to pad. On the ventral side of the terminal segment, in addition to the spiniferous pad, is seen the diamond shaped anal area, around the margin of which is a fringe of close set spinules. No spinules on any part of the body except the ventral fusiform areas and the margin of the anal field. All spinules concolorous with the body. Caudal end of the body somewhat truncated. No marginal tubercles about stigmal field. Stigmata are elevated on distinct stalks which project backwards and slightly upwards and diverge a little from each other. The stigmata (Plate 1, Fig. 5) are about 0.07 mm. in diameter and about 0.13 mm. apart. Three spiracles in each stigmal plate, oval in shape and radiately arranged. A button appears as a small clear spot on the upper inner side of the stigmal plate.

The accompanying figures (Plate XII, figs. 2 and 3) of the cephalopharyngeal skeleton differ in some details from the figure given by Mr. Banks.¹ His figure represents the appearance of this structure when viewed through the body wall without dissection, and was probably drawn from a specimen mounted in balsam and sent in from California by Mr. Coquillett. When the anterior end of the body is cut off and treated with potash, and the body wall dissected away, there are certain details, especially the more transparent parts of the pharyngeal skeleton, which are not otherwise visible.

A study of the larval food of this species reveals no highly specialized habit. In Doctor Howard's paper on the insect fauna of human excrement (p. 585) the rearing of the species from human feces is recorded as well from onions, cotton balls, osage, orange fruit and apples previously injured by the codling moth and it was suggested that in all cases the insect appeared to follow the work of other species. The only other published note on the larval food we have found is one by Drs. Riley and Howard in Insect Life, Vol. VI, p. 270, in which they list the following rearings in addition to those just mentioned; sumach fruit from Virignia, bolls of Solanum carolinense from the District of Columbia. The following additional records are to be found in the

¹ Banks, N., U. S. Dept. Agric. Bur. of Ent., Tech. Series 22, Plate VII, Fig. 121.

Bureau files and labels of Museum specimens; from the rotting parts of root of a melon which had previously been killed by a fungoid disease, from Ohio; from pieces of roots of Astragulus molissimus from Colorado. Puparia of this species were collected by Mr. Schwarz at Jackson, Miss., under the bark of dead and dying pine trees. To this list should be added the fact that during the past season it has been found in large numbers in moist bran and in bran-manure mixture.

Very little is known as to the developmental periods of this fly. From unpublished notes in the Bureau of Entomology we earn that Mr. Coquillett observed a female ovipositing in a hole in a fallen apple, the hole having been made by a larva of Carpocapsa pomonella. Upon cutting open the apple he found 36 eggs scattered about in the cavity, about a dozen being placed on end in a cluster, the others scattered about, lying on one of their sides. This was on September 10, 1888, and the first larva pupated on November 8. Allowing two days for the egg stage this would give a larval period of 57 days. On one of Dr. Howard's experiments there was a developmental period of 27 days. The writer's experience during the last summer indicates a larval period of from 12 to 14 days, shortened no doubt by the high temperature of the fermenting bran in which they were feeding. The pupal period lasts from 7 to 12 days. In Mr. Colquillett's notes there is recorded one 8-day and one 10-day period.

The following notes on the behavior of these larvae may be of some interest, as nothing has heretofore been published on this

subject.

The larvae of Euxesta notata do not seem to be quite so strongly negative in their reaction to light as are the larvae of many other Diptera. At least they were seen more frequently and in greater numbers on the surface of the moist bran and the bran-manure mixture. Some larvae of practically all the species which were breeding in these materials were to be found on the surface in full view on warm cloudy days after a rain, or early in the morning before the sun was high. The Euxesta larvae were seen in great numbers at such times, and also some of them would appear on the surface during the brightest parts of the day.

When present on the surface of the medium they exhibit a very curious leaping habit, similar to that of the cheese skipper. They bend the body in a loop, apparently seizing the stalks of the posterior stigmata or a fold in the chitin around the anal area by means of the mandibular hooks, and then unbend with a suddenness that hurls them through the air for a distance of from 1 to

5 inches.

They appear to be vegetable feeders as a rule, but one case came under the writer's observation in which some of them were

feeding on dead animal matter. Early on the morning of July 10 examination was made of a pile of bran-manure mixture. sun was not shining brightly and the surface of the mixture had not yet dried off. Hundreds of larvae were in full view feeding on the semiliquid matter of the surface. The larvae of Musca domestica, Stomoxys calcitrans, Ophyra leucostoma, and others were in evidence, but the larva of Euxesta notata outnumbered them In two or three spots some Euxesta larvae were congregated in active squirming masses. Thirty or forty of them could be seen intensely active and tumbling over one another in an apparent attempt to get at some choice bit of food. These masses were taken up in vials, and after they had scattered a little it was seen that each group had been feeding on a dead maggot, which upon examination proved to be the larvae of Musca domestica. There were three or four openings in the body walls of the dead larva, most of them occurring in the intersegmental sutures, and through these the Euxesta larvae were lapping up the fluid contents in the interior. In these observations there is, of course, no evidence that the Euxesta larvae are predaceous in habit. In fact, a number of considerations point to the contrary. house fly larvae are about twice the size of Euxesta, and presumably could easily escape unless overwhelmed by sheer weight of numbers. Euxesta larvae were never observed attacking the living larvae of the house fly. The list of larval foods given above indicates that it is normally saprophagous. It is interesting to note in this connection that it possesses none of the structural characters which, according to Keilin,1 are peculiar to certain anthomyid larvae which are said to be exclusively carnivorous or predacious in habit during the latter stages of their develop-Some of these characters are (1) mandibles strong and close enough together; (2) pharyngeal sclerites long and strongly chitinized, almost black. No trace of longitudinal folds on the internal face of the ventral part, (3) the hypostomal sclerite not of an H-form, and is strongly chitinized and separated only at the anterior part, (4) a small rod is present at the side of the mandibles, extending forward and is dentate at the free extremity, (5) labial palpi present and elongate. It will be seen by reference to the figures that none of these characters are present in the larvae of Euxesta notata.

Finally it is desired to record the fact that the larvae of *Euxesta* notata show a pronounced migratory habit. A reference to this habit is made in Mr. Coquillett's notes. In his observations on the larvae breeding in a decaying apple, he found that the larvae

¹ Keilin, D. Bul, Soc. Ent. de France, Dec. 23, 1914.

which were fully fed deserted the apple and pupated in the bottom of the box. He suggested that their normal habit is to enter the earth to pupate. In the maggot trap experiment mentioned above, about 1300 larvae of this species were caught in the water below the moist bran, as compared with 1430 larvae of the house fly from the same medium. The bran was moistened and put in the trap on June 9. The larvae of Muscina stabulans were the first to appear in the water below. They were first caught on June 15, and the migration ceased on June 21. House fly larvae were first caught on June 17, and continued to appear until June 26. The larvae of Euxesta migrated during the period from June 21 to July 1. The experiment was ended at that time and there were still a number of these larvae in the bran. The larvae of Ophyra leucostoma first appeared on June 25, and some were present when the experiment ended.

This is an interesting sequence which at first thought would be easily explained on the basis of differences in the length of the larval periods, the larvae developing most rapidly being the first to migrate. But it is quite possible that a close study of the exact time when eggs were deposited would reveal some connection between the time of deposition and the particular stage in the process of fermentation. In other words, different species of flies are probably attracted to different combinations of decomposition products, and if all the chemical and biological changes that take place in a fermenting mass such as moist bran, were known, it might be possible to discover some correlation between such

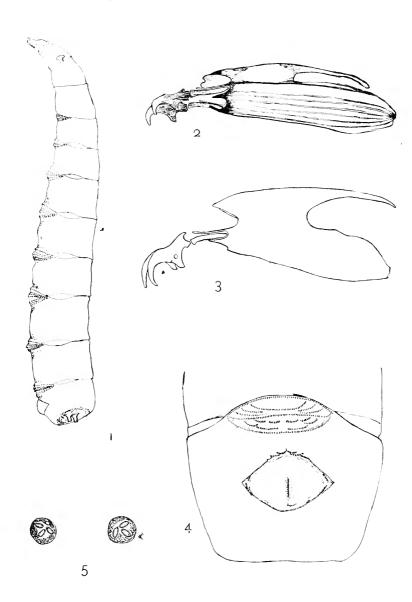
changes and the sequence of the dipterous fauna.

Neither the larvae of Euxesta nor of Ophyra were taken from horse manure under the same condition as the bran. Horse manure has of course undergone destructive changes before evacuation from the alimentary canal, and the remaining stages of fermentation are passed through rapidly. These facts suggest that only those flies with a short larval period are adapted for life in this quickly fermenting medium, and that those with a longer larval period seek out substances which change more slowly in which the destructive processes have to begin from the beginning, as it were.

EXPLANATION OF PLATE XII.

Fig. 1. Full grown larva of Euxesta notata as seen from the left side \times 14.

Fig. 2. Cephalopharyngeal skeleton of mature larva, indicating more highly chitinized parts and the longitudinal folds in the ventral wall of the pharyngeal schlerite. Outlines by camera lucida after treatment with KOH. \times 100.



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- Fig. 3. Cephalopharyngeal skeleton seen from the left side. Outline by camera lucida. \times 100.
- Fig. 4. Ventral view of the terminal segment, showing spiniferous pad and spinules on the margin of the anal area.
- Fig. 5. Posterior stigmata. Outline by camera lucida from a slide mount after treatment with KOH. imes 100.

A NEW SPECIES OF WEEVIL INJURING ORCHIDS. 1

By H. S. Barber, Bureau of Entomology.

In 1913 a specimen of a beautiful black and white weevil was brought in by Mr. Heidemann from Field's greenhouse in this city where it had been found on a plant of Cattleya mossiae supposed to have come from Venezuela, and was determined by Mr. Schwarz as Cholus forbesi Pascoe 1876, since it agreed with the original short Latin diagnosis² cited by Champion 1906.³ Recently another specimen was received for determination from Mr. J. G. Sanders with the statement that much damage was being done to Cattleya orchids in a greenhouse in Milwaukee, Wis., the large pale yellow larvae burrowing in the stems and practically killing the plant beyond the point of injury. The unsatisfactory nature of Pascoe's diagnosis and the omission of mention of the nude pronotum in Champion's allusion to this species caused the writer to forward a photograph and sketch of the ventral markings to Mr. G. C. Champion in London for verification of the determination, but he replied that although allied to Cholus forbesi Pascoe, C. nigronotatus Champ., and C. nigromaculatus Champ., of each of which he had seen two specimens displaying no noteworthy variation, the species in question is evidently distinct from them, all three having a variegated pronotum and different elytral patterns. It is possible that the species has already been described but a search of the more recent literature did not disclose a similar species and it is thought best to describe and illustrate the species as new. Mr. Sanders has tried to trace the origin of the colony at Milwaukee but beyond learning that the weevils probably were introduced in plants purchased in 1915 from a Philadelphia firm and that these plants came either from Colombia or northern Brazil, he could secure no accurate information.

 $^{^{1}}$ Cholus cattleyae Champion, Ent. Month, Mag., Sept., 1916, p. 201, may be this species but it has pronotal maculae.

² Proc. Ent. Soc. Lond., 1876, p. XXX.

³ Biol. Centr.-Amer. Coleop., vol. 4, pt. 4, p. 742.

Cholus cattlevarum, n. sp.

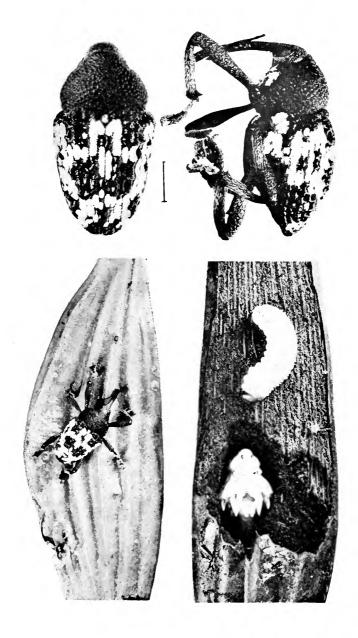
Type: Cat. No. 20428, U.S. N. M.

Reared from Cattleya spp. probably from Columbia, or Venezuela, or northern Brazil.

Robust, coarsely sculptured, black species, with irregular pattern of dense white scales on elytra, pro-, meso-, and metasternum, meso- and meta-pleurae and abdominal sternites; pronotum devoid of vestiture; length, excluding rostum, 9 to 12 mm.; width at humeri, 5 to 6 mm.

Head without vestiture except for a few scattered fine white scales beneath the eyes; occiput coarsely confluently punctate; rostum twice as long and one-fourth as wide as diameter of head, coarsely rugosely punctate basally on each side of the narrow smooth carina, the punctures becoming finer and sparser towards apex which is two-fifths wider than at base; eyes broadly oval, nearly twice as long as the narrowest width of the rostum. Prothorax one-fourth wider than long, widest at basal third, without vestiture above but with a broad W-shaped patch of dense white scales before the coxae; upper surface and sides opaque, microscopically alutaceous except on the polished summit of the coarse, concentrically arranged, lunate rugosities, on the discal side of each of which is set a single short stiff black hair. Front coxae separated by about two-thirds the width of one coxa, and exposing a rather large pentagonal centrosternal piece with finely alutaceous sculpture between the tip of the prosternal lobe and the pair of inflated postcoxal processes of the epimeron. Scutellum small, elongate, prominent, and clothed with white scales. Elytra one-fourth longer than wide and one-fifth wider than pronotum; widest at humeri, the sides convergent and nearly straight to about apical fourth, apices rounded; surface extremely coarsely sculptured with ten series of irregularly impressed punctures, the intervals unevenly inflated; color black with an irregular design in dense white scales, the nude areas generally more prominent than the squamose areas; third interval more strongy inflated in basal and median fourths, the sixth interval more strongly inflated at post-median fourth. A small patch of white scales and hairs intermixed, on the mesosternum and a much larger patch of white scales on the metasternum. Second abdominal segment with a narrow median and broad lateral squamose patches, third and fourth segments with small lateral squamose spots. Tarsi and tibiae (except base) clothed densely with pale hairs, basal half of middle and hind femora with sparse pale hairs. All femora equally dentate; outer apical angle of tibiae not unguiculate. Mesosternum not protuberant between the intermediate coxae.

In the accompanying plate (Plate XIII) the upper photographs were made from the type and are enlarged to about five diameters. The lower photos which are about twice natural size were received





from, and used by permission of Mr. Sanders and show a pupa in its cell in the leaf stem, a full grown larva, and an adult on the swollen leafstem of its hostplant.

EGG-DISPOSAL IN DERMATOBIA HOMINIS.

By Frederick Knab, Bureau of Entomology.

Within the last few years the statement has been made by a number of writers that infestation with Dermatobia larvae occurs through the intervention of mosquitoes, the eggs of the fly having been found attached to the latter. At least three different observers have independently reported finding mosquitoes with Dermatobia eggs attached (1, 2, 3); figures have been published showing the mosquito with the eggs in situ, and one author, Surcouf (4), has figured the newly hatched larva as well. However. beyond the bare facts just indicated, very little of a reliable or positive nature has been contributed to the subject. Opinions as to the manner in which the eggs become fastened to the mos-Some assume that the mode of infestation quito differ widely. indicated is exceptional or accidental and contend that normally the eggs are attached directly to the vertebrate host by the mother Among Venezuelans it is claimed that the fly deposits her eggs upon the foliage of a special kind of tree there known as "Guácimo simarrón," and that men and animals become infested by contact with leaves bearing *Dermatobia* eggs or larvae. Finally, some authors deny altogether the intervention of the mosquito. In view of the existing confusion, it seems desirable to put on record any additional data bearing on the subject, even though but a repetition of what has been already made known.

During the session of the second Pan-American Scientific Congress in Washington this past winter, the writer had the pleasure of meeting Dr. Rafaël Gonzalez-Rincones of Caracas, who was one of the first to report the occurrence of the *Dermatobia* eggs upon the mosquito. Dr. Gonzalez-Rincones had with him two specimens of mosquitoes with *Dermatobia* eggs attached and he very kindly presented these to the writer. These specimens are of the greatest interest and their examination enables us to make several deductions. In both cases the mosquito is a female *Psorophora* (*Janthinosoma*) lutzii, the same and only species definitely identified as bearer of the *Dermatobia* eggs by previous writers. In both cases the eggs, eight or ten in number, form a

¹ Prof. H. Pittier of the Bureau of Plant Industry informs me that this tree is the *Guazuma tomentosa* H. B. K. of botanists.

little package attached ventrally to the base of the mosquito's abdomen. They are attached by one end and point obliquely downward and backward in such a way that when the mosquito sucks blood the free or hatching end is nearest the skin of the phlebotomized victim. Highly significant in this connection is another circumstance. The mosquitoes are preserved dry, upon pins, and inclosed in small glass tubes. In one of the specimens there is to be seen, adhering to the inner surface of the vial, a newly hatched *Dermatobia* larva. The conclusion is well-nigh unescapable that at the time the mosquito was introduced the warmth of the hand holding the tube caused the Dermatobia egg to hatch. It would thus seem, and this idea has been already expressed by me in a previous paper (5), that the fully matured first-stage larva remains within the egg until the mosquito has found a host, the warmth given off by the vertebrate acting as a stimulus to the waiting larva. The heavily chitinized condition of the anterior half of the young larva further supports

Recently a third specimen of mosquito with *Dermatobia* eggs attached has come to hand. This was sent by Dr. Rafaël Morales of Guatemala City.¹ Doctor Morales, it should be noted, appears to have been the first to announce, in 1911, the strange relation between *Dermatobia* and the mosquito (1), and in a more recent paper (6) he has added further data in proof of it. The specimen sent by him is preserved in fluid and much abraded, so that its specific identity is uncertain. However, it is unquestionably a *Psorophora*, and in all probability the species *lutzii*.² There are eight *Dermatobia* eggs, attached in a package in exactly the same manner as in the two Venezuelan specimens above described. They are attached to the mosquito and to each other by means of a varnish which is insoluble in water or alcohol.

The fact that in all three specimens before me the eggs are attached to the mosquito in precisely the same manner, beneath to the base of the abdomen and with the hatching end free and pointing downward, leaves no room for doubt that the mother *Dermatobia* herself thus attaches them. This is also the opinion of Doctor Morales and one of his best reasons for this belief is that "the eggs are firmly attached to the body of the mosquito

¹ In my previous paper I made the erroneous statement that Doctor Morales is a native of Costa Rica.

² Doctor Morales believed this specimen to be a *Culex*, no doubt on account of the absence of striking characteristics, the scales, as already noted, having been almost completely worn off. I am inclined to believe that the reference to *Culex* as vector of the Dermatobia eggs in Doctor Morales' papers is attributable to the same circumstance.

by a chitinous substance which must be fluid at the time of oviposition and which hardens upon exposure to the air" (6). The fact that the mosquito serving as vector is one of the most bloodthirsty species is also significant. Further arguments in support of this view have been given by me in a previous paper (5) and need not be repeated here. In short, there is no longer room for doubt that the female Dermatobia normally attaches its eggs to female mosquitoes, selecting for this purpose definite species with a keen appetite for blood in order that the transfer of the young larva to a suitable host may be assured. Statements as to other modes of infestation, such as the occurrence of the eggs or young larvae of Dermatobia upon foliage, must be treated with suspicion until definite proof is forthcoming.

Proof that the eggs in question are really those of Dermatobia has been furnished through the rearing of the flor from such eggs by Doctor Morales. In his second paper he announced the receipt of further specimens of mosquitoes with Dermatobia eggs attached. Newly hatched larvae from this material were transferred to rabbits and the metamorphosis was successfully completed. Doctor Morales had already made the attempt with his first specimen, one of the eggs having hatchel ten days after its receipt. He placed the newly hatched larva upon the forearm of a servant, where it moved about as if seeking a suitable place of entrance. To induce the larva to peretrate the skin, the epidermis was slightly abraded and this at once had the desired_effect. Development went forward in the typical manner, already well known, for 27 days. The patient then expressed a desire to be relieved, the arm having become much swollen and there being severe lymphangitis. The laws, which already had a length of 1 centime er, was extracted and transplanted to a rabbit, but failed to reach maturity. Dr. Polro Zepeda, in Nicaragua, has 1 rod (ced infestation with Dermatobi i larvæ experimentally by eausing human subjects to be bit e by mosquitoes bearing the eggs of the fly (3). He has observed the Dermatobia larva leaving the mosquito while this was sucking blood. reached the skin, it at once "by an admirable instinct" finds the punctured spot and enters, the subject hasing become insensitive to the penetration of the larva through the anesthetic and irritating action of the mosquito's saliva. Doctor Zopeda states further that he has found the *Dermatobia* eggs attached to the femora, antennæ and prothorax of the mosquito.

Before leaving the subject, attention must be called to a misleading inaccuracy in the figure published by Dr. Louis W. Sambon (7) and repeated by Doctor Balfour (8). The eggs are shown as attached by their sides to the belly of the mosquito, with the

whole length of the egg in contact. This is assuredly an error on the part of the artist, no doubt attributable to the manner in which the specimen was prepared. Doctor Sambon's paper is valuable, not only for the able discussion of the recent progress in our knowledge of *Dermatobia*, but particularly for its diligent exposition of the extensive literature relating to this remarkable fly.

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In discussing Mr. Knab's paper, Dr. Townsend suggested that the female *Dermatobia* was probably led, through an olfactory tropism, to oviposit upon the body of the carrier; that the eggs were incubated in the uterus and contained the fully-formed maggot at time of deposition; that the maggot was led, through a positive thermotropism, to escape from the chorion at the time that the carrier imbibes a meal of warm blood; and that the maggot is unable to penetrate thick skin of itself but must enter the puncture made by the carrier, being perhaps guided thereto

by the odor of the serous exudation following the withdrawal of the carrier's proboscis. He stated that Cuterebra parasitizes only thin-skinned hosts, and has developed no carrier habit to enable it to extend its parasitism to such thick-skinned hosts as man, cattle, dogs, etc., as has evidently occurred in the case of Dermatobia, which was probably likewise confined originally to thin-skinned hosts; that this has probably been due to a less acute sense of smell in Cuterebra, which has the third antennal joint atrophied, while Dermatobia has the same very well developed. Dr. Townsend gave various details, all of which he considered to uphold the above mentioned deductions.

Two-Hundred and Ninety-Fifth Meeting, May 4, 1916.

The 295th meeting of the Society was entertained by Mr. Frederick Knab at the Saengerbund Hall, May 4, 1916. There were present Messrs, Baker, Böving, Burgess, Busck, Crawford, Cushman, Ely, Gahan, Greene, Howard, Jennings, Kewley, Knab, Kotinsky, Middleton, Morrison, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Snyder, and Townsend, members, and R. M. Fouts and Frank Morton Jones, visitors.

The Corresponding Secretary announced the resignation from the Society of Mr. O. G. Babcock and Mr. A. A. Girault.

Mr. Harold Morrison of the Federal Horticultural Board was elected to active membership.

Mr. Schwarz announced the election of Dr. L. O. Howard as a member of the National Academy of Sciences, and it was ordered that his remarks be incorporated in the Proceedings of the Society and that the Society extend congratulations to Dr. Howard.

Mr. Schwarz remarks were as follows:

I take pleasure in announcing to the Society that our fellow member, Dr. L. O. Howard, has, in April last, been elected a member of the National Academy of Sciences. This is the highest honor that can be bestowed on any scientific man in the United States and all of us will agree that this honor was well earned by Dr. Howard. He has done a good deal of meritorious work in systematic and bionomic entomology; he has published many important works on economic entomology but above all he is now, and has for many years been the efficient chief and leader of the Bureau of Entomology, and as such has acquired a world-wide and deserved reputation. Under the enlightened and liberal administration of Dr. Howard the growth of the Bureau of Entomology has been really marvellous. It has become a model for the many similar, though much smaller, institutions that have been established of late years in many countries.

To those of our members who are not acquainted with the history of the National Academy of Sciences the following entomological notes may be of interest: Since the organization of the Academy the following entomologists were elected members of the Academy: Dr. John L. Leconte who was one of the charter members, Dr. A. S. Packard, Mr. Samuel Seudder, Prof. W. M. Wheeler (in 1912) and Dr. L. O. Howard in 1916. Of these Leconte, Packard, and Scudder are dead, leaving only two living members viz. Wheeler and Howard. Some other members wrote entomological papers viz. S. S. Haldeman, Alpheus Hyatt, Joseph Leidy, and Charles S. Minot who are now dead, and Mr. E. S. Morse and Prof. Wm. Trelease among the living members, but all these were elected to the Academy for work in other fields of Science.

The following program was presented:

A SYNOPSIS OF THE GENUS CALAPHIS.

(Homoptera, Aphididae.)

By A. C. Baker.

The genus Calaphis was erected by Walsh (1862) for his species betalella. It was not until some years later that Walker (1870) erected his genus of the same name. One species only was for years referred to the genus but quite recently Gillette (1910) has referred other species here. A study of the forms found in this country has led the writer to place in the genus five species.

Del Guerico (1913) erected the genus Siphonocallis with betulæcolens Fitch as type. In studying this species and comparing it with betulella one thing is noted to distinguish the two generically. The radial sector is always absent in betuella. In some specimens of betulæcolens it is however very faintly indicated. In the species alni described in this paper the radial sector is absent normally and the wing is very similar to that of betulella. In some specimens, however, this vein is indicated in much the same way as in betulæcolens. In the other two species the vein is sometimes strongly indicated and sometimes very faintly indeed. Considering this variation in the presence of the vein the writer feels that it can hardly be considered a good character on which to distinguish two genera. He therefore makes Siphonocallis a synonym of Calaphis.

Wilson (1910) in his description of the genus Calap' is when speaking of the antennae, gives as a character "sixth about one-half the length of the spur." While this character holds for the type species it is evidently a specific character for it does not hold true for any of the other species, even for alni, which is undoubtedly very close to betulella. If this character were considered, a new genus would have to be erected for each species

included in the present paper.

The characters of the genus may be given as follows:

Antennae longer than the body, slender, and armed with short spine like bristles; segment six with the unguis much longer than the base; antennal tubercles prominent, vertex armed with a few hairs; wing veins more or less bordered with black and with the radial sector absentor faintly indicated; cornicles short, somewhat tapering, broadened at base; eauda knobed; anal plate bilobed; both cauda and anal plate with numerous long stout hairs.

- D. Unguis of segment VI between two and three times as long as base:
 - Head and thorax longitudinally striped with black. All wing veins heavily bordered with black...betulella Walsh.
 - (2) Head and thorax not so striped; wing veins not heavily bordered with black......betulaecolens Fitch.

Calaphis betulella Walsh.

Measurements of antennae of the alate viviparous female are as follows: IV, 1.04 mm.; V, 0.752 mm.; VI, (0.24 mm. + 0.56 mm.). Segment III, almost smooth or very finely imbricated, armed with many short stiff spine like hairs about 0.048 mm. long and armed on its basal half with 12 or 13 small almost circular sensoria. Segment IV, more distinctly imbricated and armed with similar spines, but without sensoria. Segment V, like segment IV, with the imbrications most distinct distad, and with an elongate fringed distal sensorium fully 0.128 mm. long. Segment VI, with a similar elongate fringed sensorium at base of unguis. Head with a few hairs but with no capitate ones. Cornicles 0.144 mm. long and 0.112 mm. wide at the base, tapering and somewhat flaring.

Calaphis betulaecolens (Fitch).

Aphis betulaecolens Fitch.
Callipterus betulaecolens Monell.
Callipterus betulae Thomas.
Callipterus betulaecolens (Fitch) Oestlund.
Siphonocallis betulaecolens (Fitch) Del Guercio.
Calaphis betulaecolens (Fitch) Gillette.

The color characters of this species were well given by Walsh in

his original description.

This species was described as an Aphis by Fitch (1851). Later Monell (1879) described his Callipterus of the same name, not knowing positively that it was the same species. Oestlund (1887) referred Monell's species to Fitch's name. The excellent description given by Davis (1910) is referred positively to Monell's species which Davis knew, but doubtfully to Fitch's species. In the National Museum collection there are two specimens of betulæcolens bearing Fitch's label and marked type.

These specimens are part of the original lot in the Fitch collection and they were mounted from that collection by Mr. Theo. Pergande. Through the kindness of Mr. Davis the writer has had an opportunity to examine Monell's type and this agrees in all details with Fitch's specimens. There is therefore no doubt

that the two species are the same.

Following are a few notes on the alate viviparous female:

Antennal segments, average measurements I, 0.144 mm.; 11, 0.08 mm.; 111, 0.96 mm.; IV, 0.7 mm.; V, 0.544 mm.; VI, (0.144 mm. + 0.56 mm.). Segment 111, is armed with 10 to 13 oval sensoria on the basal half and somewhat imbricated distad. Segment V, has the distal sensorium fringed and somewhat elongate though not nearly as elongate as that of betulella. The sensorium at the base of the unguis of VI, is likewise not as elongate as in the species mentioned. Head with a few hairs. Cornicles about 0.144 mm.; long, nearly cylindrical though somewhat tapering and flaring.

Calaphis castaneae (Fitch).

Callipterus castaneae Fitch. Calaphis castaneae (Fitch) Gillette.

The original description of this species given by Fitch (1856) is, although short, sufficient to characterize it, owing to the striking coloration of the insect. Few references to the species occur but it is by no means rare in the Eastern States and in some localities it is quite abundant.

In order to be positive of his determination the writer examined the Fitch collection of Aphididae and located three pined specimens bearing Fitch's label. Considering their age and the method of mounting, these specimens are in good shape and upon mounting in balsam prove that the insects Fitch had were the same species as that met with about Washington. In one specimen the radial sector is absent from the wing in much the same way as in betulella Walsh. In fact a series of specimens show that this vein varies greatly. Sometimes being strongly present and sometimes very faint indeed.

Alate viviparous female.—Antennal measurements average as follows; I, 0.144 mm.; I1, 0.08 mm.; III, 0.96 mm.; IV, 0.544 mm.; V, 0.432 mm.; VI, (0.176 mm + 0.544 mm.). Segment III, is finely imbricated and armed with numerous fine bristle-like hairs not as stout as those of betulella. On the basal half of the segment there are about eight circular sensoria. The head is armed with hairs which are rather more prominent than those of the two species mentioned previously. Cornicles somewhat shorter than those of the type species being 0.096 mm. long and about as wide at the base as they are long.

Calaphis castaneoides, n. sp.

Alate viviparous female.—Morphological characters: Antennae as follows: I, 0.096 mm.; II, 0.064 mm.; III, 0.784 mm.; IV, 0.432 mm.; V, 0.368 mm.; VI, (0.16 mm. + 0.8 mm.); Segment III, with 6 to 10 circular sensoria. Forewing 2.21 mm. long and about 0.738 in width. Cubital and anal veins heavier than the media. Radial sector absent or but very faintly indicated at one extremity. Cornicles 0.16 mm. long and about 0.192 mm. broad at base. Cauda and anal plate normal.

Color characters: Very similar to those of castanew which the species resembles greatly. Antennae with the basal half of segment IV and V and often the middle of III, light or yellowish, the remainder dark. In this the species differs from castanew in which the antennae are uniformly colored. Wings with the anal vein, the upper half of the cubital and the lower margin of the stigma bordered with black. Tibiae and feet black, the middle portion of the tibiae often yellowish.

This species bears much the same relation to castaneae that walshii Mon., does to bella Walsh. It is distinguished principally by the greater length of the unguis of the sixth segment.

Described from specimens in balsam mounts taken on Castanea

at Washington, D. C. 1900.

Type Cat. no. 20210 U. S. Nat. Mus.

Calaphis alni, n. sp.

Alate viviparous female.—Morphological characters: Antennae as follows: I, 0.128 mm.; II, 0.064 mm.; III, 0.88 mm.; IV, 0.672 mm.; V, 0.592 mm.; VI, (0.224 mm. + 1.28 mm.). Segment III is very faintly imbricated and armed with very short stiff hairs much shorter than those on the antenna of the other species. On its basal three-quarters the segment is armed with about 14 circular sensoria in a row. The sensoria on the distal extremity of V and on VI at the base of the unguis are elongate, that on VI being 0.048 mm. long. The head is armed with several hairs which are somewhat knobbed. Prothorax with similar hairs. Forewings 2.56 mm. long and about 0.88 mm. wide. Veins distinct; radial sector absent; cornicles 0.128 mm. long and about 0.112 mm. wide at base, distinctly tapering, imbricated, anal plate not deeply cleft. Abdomen covered with capitate hairs.

Color characters: General color yellowish; antennae and tibiac dusky or black wings with the cubitus and anal veins somewhat bordered with black. The other veins and the stigma faintly bordered. Cornicles dusky. Abdomen marked with black usually with a large black patch between and in front of the cornicles.

Apterous viviparous female.—Morphological characters: Antennae as follows: 1, 0.128 mm.; 11, 0.064 mm.; 111, 0.672 mm.; IV, 0.368 mm.; V, 0.368 mm.; V1, (0.16 mm. + 0.96 mm.). Segment III, imbricated and armed with 6 to 10 circular sensoria in a row. Head with prominent capitate hairs, in fact the entire body is covered with these hairs; many of which have a funnel shaped extremity. Cornicles as in the alate form. Length from vertex to tip of abdomen 2.24 mm. Color characters: Antennae and tibiae dusky to black; body marked with black usually with a blotch on the head, a band across the prothorax, a similar one caudad of it and a band across the abdomen in front of the cornicles. The remainder of the dorsum spotted with black.

Described from specimens in balsam mounts taken by Mr. Theo. Pergande on alder near Washington, D. C., 1899.

Type Cat. No. 20211 U. S. Nat. Museum.

Other specimens of males and oviparous females taken on the same plant near Washington and at Vienna, Va. by the writer, appear to be the same species. We are not describing them, however, since they have not been taken in company with the viviparous forms.

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THE TACHINID GENUS ARGYROPHYLAX B. & B.

By W. R. Walton, Bureau of Entomology.

This genus was proposed by Brauer and Von Berganstamm¹ for the reception of a single individual from St. Thomas, West Indies and described many years previously by Wiedemam² as Tachina albincisa. An additional specimen of the latter species was discovered by Van der Wulp in the Biologia Centrali Americana³ material which specimen he states Professor Brauer saw and identified as Argyrophylax albincisa Wied. I have recently received two specimens reared at Rio Piedras, Porto Rico. January 24, 1912, by T. H. Jones from Nacaleia indicata Fabr. These specimens seemed to be identical with Van der Wulp's specimen mentioned above, although his description of the same is very brief. Therefore in order to allay all doubt as to the matter I have secured a comparison of one of the reared

¹ Zweifl. d. Kaiserl. Mus., IV, 163; V, 343.

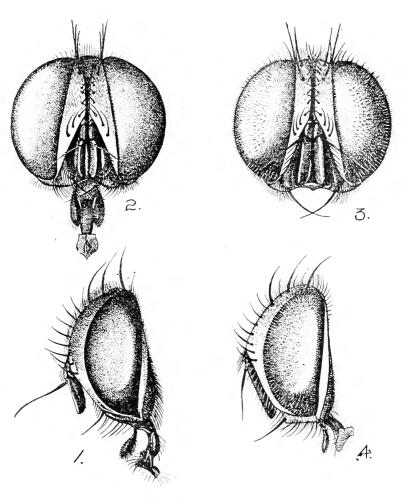
² Auss. Zweifl., II, 334 (Tachina).

³ Biolog, Dipt. II, 485, Pl. XIII, fig. 19.

individuals before mentioned with Van der Wulp's specimen deposited in the British Museum, and am greatly indebted to Mr. John E. Collin of Sussex Lodge, New Market, England for this service. Mr. Collin's report makes it abundantly evident that the specimens are conspecific.

The following description and accompanying figures will I trust render the identification of this form more easy hereafter.

Male.—Palpi normal, first vein bare, face on lower half of sides bare, proboscis shorter than height of head, apical cell not petiolate ending in costa well before the wing tip. Eves bare, facial ridges bristly on lowest third, antennae inserted at middle of eyes, hind tibiae outwardly distinctly ciliate, ocellar bristles absent, all frontal bristles curving more or less backward, the last two pairs very stout; palpi slightly spatulate. Front, in lateral elevation, distinctly produced in a gentle curve almost parallel with anterior margin of eye, cheeks extremely narrow, abdomen short, conical, wings rather broad and short. Body robust, gray and black, head (figs. 1 and 2) broader than thorax, wings hyaline. Length 6 mm. Front less than one-half eve width covered with pollen which has the property of appearing bright silvery from above and dull smoky gray when viewed from immediately in front or from side. Vitta, black, narrow, almost linear. Vertex brown. Superior posterior orbit and occiput linear. The inferior posterior orbit expanded and silvery pollinose. Lower occiput slightly swollen and bearing abundant black hairs. Sides of face narrow, concolorous with front. Facial depression large, rather deep, and slightly carinate, vibrissae at oral margin, well developed. cruciate. Cheeks linear, covered with black hairs and bearing a row of macrochaetae on their lower edges. Orbital bristles absent. black, third joint a little more than twice as long as second. Arista slender. second joint short, third slightly enlarged on basal fourth; microscopically pubescent nearly to middle. Thorax black, shining, only lightly gravish pollinose on anterior portions; two pairs of vittae visible anteriorly, becoming obsolete posterior to suture. Scutellum concolorous with thorax, bearing three marginal and a small apical pair. Dorso-central bristles four; sternopleural two, the latter region clothed with abundant black hair. Abdomen cortical, black, shining, bases of the last three segments bearing whitish pollen, traces of a median black vitta apparent on intermediate segments when viewed from rear. Four segments visible from above, all rather thickly clothed with longish, nearly erect, black hairs. First two segments bearing marginals only. Third with a strong marginal row. Fourth bearing both discals and marginals. Legs, including coxae black, robust, hind tibiae thickly ciliate on outer sides. Middle tibiae bearing one or two macrochaetae upon thin outer front third. Wings hyaline, veins brownish, apical cell broadly open in costa, bend of fourth vein destitute of stump or wrinkle, distinctly angulated. Hind cross vein ending slightly beyond middle of discal cell, bisinuate. Third vein bearing three or four small bristles at base.



EXPLANATION OF PLATE XIV.

- Fig. 1. Argyrophylax albincisa Wied., side view of head.
- Fig. 2. Front view of same.
- Fig. 3. Pseudochaeta argentifrons cog. Front view of head.

Fig. 4. Same, side view.

Two male specimens reared from Nacaleia indicata Fabr., at Rio Piedras, Porto Rico, January 24, 1912, by T. H. Jones.

From the foregoing it seems evident that the reference of Sturmia scrizuræ Coq. to the genus Argyrophylax by Doctor Townsend¹ is obviously erroneous.

In the sense of Coquillett this form is a true *Frontina* as the facial ridges beara strong row of bristles quite to or beyond their middle.

Because of the remarkable superficial resemblance between A. albincisa Wied. and Pseudochæta argentifrons Coq. I have included drawings of the latter species also.

In discussing Mr. Walton's paper, Dr. Townsend stated that he believed the determination of Argyraphylax albincisa to be correct; and emphasized the importance of securing positive identifications of Brauer & Bergenstamm's American genotypes. He pointed out that, while these authors went as far as anyone could feel justified in going on external adult characters alone. they did not possess, as we do today, the reproductive characters to demonstrate to them the value of certain slight but constant external adult characters for separating distinct forms, and hence did not include such slight characters in their system; as a result, their generic characterizations will often apply equally well to very distinct forms. The European species which stand as genotypes of their genera are quite well known; but the American forms are by no means well known, and every positive determination of their American genotypes represents a distinct gain.

Under the head "Short Notes and Exhibition of Specimens" the following were presented:

A NEW BEE OF THE GENUS DIANTHIDIUM.

By S. A. Rohwer, Specialist in Forest Hymenoptera, Bureau of Entomology.

Dianthidium arizonicum, new species.

This species is extremely closely allied to texanum Cresson but the seventh sternite is broadly black and the front between the antennae has two rounded ridges. The next differs from that of texanum in that the cocoon does not extend beyond the surface of the next.

¹ Taxonomy of the Muscoidean Flies, p. 98.

Male.—Length 9.5 mm. Anterior margin of the clyptus truncate, the lateral angles rounded, its surface more closely punctured than the face; face with large, distinct, separate punctures; front with close, distinct punctures; the inner margin of the eyes raised into elongate, narrow, blister-formed elevation; vertex and posterior orbits with distinct, large, separate punctures; fourth antennal joint about twice as wide as long, about half as long as fifth and one-third longer than the third; tegulae large, sparsely punctured anteriorly but closely punctured posteriorly; mesonotum with close, distinct, rather large punctures; mesoscutellum truncate posteriorly, punctured like the mesoscutum; abdomen with large, close punctures; these punctures are not as close as those of the scutum but are separated in some places as much as those of the vertex; terminal tergite with strong, median triangular-shaped tooth which is longitudinally carinate, the lateral angles of the tergite broadly rounded; in appearance at first sight the segment seems to have a single median tooth but in reality it is tridentate, the lateral teeth being very short and obtuse; second recurrent distinctly beyond the second intercubitus, the first abscissa of the radius one-fifth shorter than the second, the second abscissa of the cubitus but little shorter than the first. Black; clypeus except apical margin, mandibles except margins, inner orbits to the top of the eye (broader below the antennae), a spot on the superior posterior orbits. two spots at the anterior margin of the mesoscutum, tubercles, a dot on the tegulae anteriorly, lateral margin of the scutellum and a band on the first five tergites which is emarginate medially and submarginate on each side, after the manner of texanum, yellowish white; tegulae and legs, except the coxae, trochanters and bases of femora, rufo-ferruginous; anterior femora and tibiae beneath and a spot on the apical ventral part of the posterior femora yellowish-white; the usual pubescence, dense and silvery white; wings strongly smoky, venation black.

Bear Cañon, Catalina Mountains, Arizona. Described from one male recorded under Bureau of Entomology No. Hopk. U. S. 12082*i* which refers to a note stating that this was reared from a nest on the twigs of *Quercus emoryi*, collected by Morris Chrisman.

Type.—Cat. No. 20297, U. S. N. M.

NOTES ON DIANTHIDIUM ARIZONICUM ROHWER.

By William Middleton, Scientific Assistant, Forest Insects, Bureau of Entomology.

In August 1914 Mr. Morris Chrisman sent to the Eastern Field Station with a lot of cynipid galls, the nest of a *Dianthidium*. This nest was collected on the twig of a narrow leafed oak at Bear Cañon, Catalina Mts., Arizona. In as much as the maker of this nest proved to be a new species which has been described

by Mr. Rohwer as *Dianthidium arizonicum* the following notes are worth recording.

This nest was a nearly globular mass of resin and small pebbles (granite sand), attached to a twig about one-half inch in diameter and at the time received contained one larva and four prepupal larvae in cocoons. It is reproduced, about natural size, on plate XV, figs. 1 and 2.

The prepupal larva is yellowish white, about 12 mm. long, constricted ventrally and expanded dorsally to form a U. The circumference of the body anteriorly is less than the circumference posteriorly which makes a somewhat pear-shaped outline. The greatest dorsad-ventrad diameter is 3.75 mm., at about two-thirds the body length beyond the head. The head is entirely pale; 1 mm. broad and 1.2 mm. high; frons triangular, not distinct; anterior margin of labrum finely crenulate, the dorsal and lateral margins arched (see fig. 3b); mandibles small and completely covered by the exterior angles of the labrum; maxillae and labium spined; antenna, situated against frontal epicranial suture about length of labrum above dorsal articulation of mandible and consists of a large pure white, membraneous circle from which a small yellowish white cone projects (see fig. 3c).

The cocoon is a thin, transparent pale brown, oval, 8.5 mm. long by 4.5 mm. broad, with one end darker, thicker and with a distinct although small mamma. The mamma has a small opening apically, basally there is a partition separating it from the interior of the cocoon (as shown in fig. 3a). The cocoons are completely buried in the nest mass and not protruding from, or exposed at, the surface, nor are they smaller than the cell to which their walls adhere.

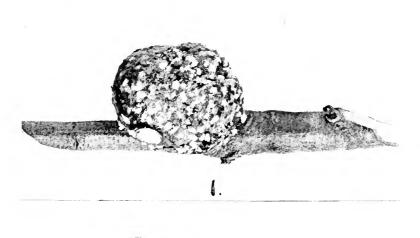
The following table summarizes some of the points known concerning the biology of this and the three other Neartic species of *Dianthidium* whose nests have been described. The data concerning *D. texanum* was taken from Melander (Biol. Bull., vol. 3, No. 112. pp. 27–34); that concerning *D. consimile* from Davidson (Ent. News, vol. 7, 1896, pp. 22–25) and that concerning *D. cressoni* from Cockerell (Bull. Am. Mus. Nat. Hist., vol. 22, 1906, pp. 444, 445).

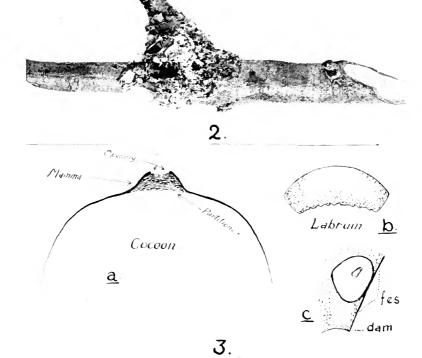
EXPLANATION OF PLATE.

Fig. 1. Entire nest.

Fig. 2. Nest broken open showing, cocoons, and cell from which cocoon has been removed.

Fig. 3. a, Section of anterior end of eccoon. b, Labrum of larva, c, Antenna and portion of head of larva showing, dorsal articulation of mandible (dam) and frontal epicranial suture (fes).







CHARACTER .	D. TEXANUM	D. ARIZONICUM	D, CONSIMILE	D. CRESSONI
Nest.	In branches Cedar, of resin and lime stone (no granite present). Mel., I. c., fig.	In branch oak, of resin and granite sand see plate, figs. I and 2	In branches Cedar, the branch oak, of a land resin and lime resin and granite (no granite sand see plate, present). Mel., figs. I and 2. Davids, I. c., fig.	Side of boulder—of resin and pebbles. Ckll., I. c., fig.
Cocoon.	Mamillated c n d or more exposed. Cocoon 10 mm. by 4.5 mm.	Cocoon entirely filling cell—not exposed. 8.5 mm. by 4.5 mm.	Mamillated c n d Cocoon entirely fill- or more exposed, ing cell—not ex- Cocoon 10 mm, posed, 8.5 mm, by 4.5 mm.	
Emergence. May 16-25	May 16-25	July 17 (at East June 1–15. Falls Church, Va.)	June 1-15.	
Locality.	Texas	Bear Cañon, Cata- lina Mts., Arizona.	Bear Cañon, Cata-Southern California. lina Mts., Arizona.	Florissant, Colo-rado.
Parasites.			Alcidamea producta Cress. ¹ Nonodontomerus montivagus Ashm. Leucospis affinis Say. Torymus anthidii Ashm. Trichodes ornatus var. tenetlus.	
The de-	termination or concl	usions are incorrect a	The determination or conclusions are incorrect as many records show this species made its own nests in stems.	ts own nests in stems.

THE NATIVE FOOD-PLANTS OF THE APPLE RED-BUGS.

By R. A. Cushman, Bureau of Eutomology.

A few years ago Prof. C. R. Crosby discovered two new species of Capsidae injuring apples in New York State. These were described by Reuter as *Heterocordylus malinus* Reut. and *Lygidea mendax* Reut. The former was christened by Crosby "the apple red bug" and the latter "the false apple red bug." Reuter

adopted this idea in naming the species.

During the spring and early summer of 1915 I had occasion to make some observations on these two species both in orchards and in wild lands. At Geneva, N. Y., malinus was fairly abundant on apple and more so on Crataegus; mendax was not found and no trees of the common wild crab were seen in the neighborhood where the observations were made. At Clearfield, Pa., in an orehard that had been grossly infested the previous season. mendax was extremely abundant and malinus occasional. waste land immediately contiguous to the orchard both Cratagus and wild crab were of frequent occurrence. On the former malinus was very abundant and on the latter mendax was equally so, but mendax was rare on Crataegus and malinus was not found at all on crab. In waste land at Westfield, N. Y., where wild crab, Crataegus and wild seedling applies were growing so close together as almost to mingle their branches, practically the same conditions prevailed as at Clearfield.

It is evident that the natural food-plant of *malinus* is not *Pyrus* but *Crataegus*, that the reverse is true for *mendax*, and that *mendax* is more likely to attack apple than is *malinus*, and it would seem that a reversal of the specific names would have been more indicative of the true conditions though not entirely appropriate, since the apple is not the natural food-plant of either.

A CURIOUS FORMATION OF A FUNGUS OCCURRING ON A FLY.

By L. O. Howard.

The insect, sent by Prof. G. C. Becker of Fayetteville, Arkansas, was a greatly shriveled muscoid fly which apparently had two gigantic halteres that in reality were two perfectly capped *Cordyceps* growths. A similar growth, uncapped, protruded from the anus of the fly.

Mr. Alden T. Speare determined the fungus as very likely *Cordyceps*, possibly being *C. dipterigena*, B. & Br., but on account of its rarity he had not crushed it for specific determination.

Mr. Speare has since found two somewhat similar specimens in the Pergande collection, but in each case the *Cordyceps* growths issuing from the wing sutures are uncapped.

In discussing this last note, Doctor Townsend said that he considered that the fly was probably a dexiid and that it succumbed immediately after issuing from the puparium, which accounted for its much shriveled condition and for the absence of wings, the *Cordyceps* growth issuing from the body at the wing sutures.

A PRELIMINARY NOTE ON THE BIONOMICS OF POLLENIA RUDIS, FABR. IN AMERICA.

By J. L. Webb and R. H. Hutchison.

The discovery during 1908 of the larva of *Pollenia rudis*, Fabr. by Keilin and subsequent studies by him have brought to light many facts on the life history of this common fly, which had up to that time remained a complete mystery. In a recent article Keilin reviews his extensive investigations, (Keilin, D. "Recherches sur les Larves de Dipteres Cyclorhaphes," Bul. Sci. de la France et de Belgique, T. XLIX, 7e Serie, 30th Dec., 1915) and we give here a brief summary of the main points bearing directly on the life history of *Pollenia*. The reader is referred to the original article for an interesting discussion.

Keilin found the larvae of *Pollenia rudis* parasitie on the earthworms, Allolobophora chlorotica and A. rosea. Eggs are deposited during August or early September on the soil. They hatch after five to seven days and the larvae, when they find an earthworm, gain entrance to the body through the male genital opening located on the ventral side of the 15th segment. From September or October to the following May or June the Pollenia larvae are found in a dormant state in the body cavity of the genital segments, i.e. from the 9th to the 12th or even as far back as the 16th. In May or June the larvae becomes active, works its way toward the anterior end of the worm, where it pierces with its posterior end the prostomium of the worm and thus exposes its stigmata. It continues to feed and gradually destroys the worm, working backward as fast as the segments are destroyed. Pupation occurs usually from the 5th to the 25th of June, and the pupal stage has a duration of from 32 to 45 days, emergence occurring from the middle of July to the first part of August.

He found only one generation per annum, but admits the possibility of the existence of a summer generation.

To our knowledge, the larvae of *Pollenia rudis* has not been recognized in this country until found by the senior author during June 1916. We have been able to verify many points made by Keilin, but find that the life history of this fly in Washington is in many ways quite different from that found by Keilin in Paris.

In the first place, worms, identified as Allolobophora chlorotica, were collected in many places near Washington and several widely separated places in the United States during October, November and December, 1915. These were examined by Dr. Townsend, Mr. Kisliuk, and by the writers, but no infested worms were found during that period. In the Spring of 1916 no infested worms were found during April, although collections and examinations were made from time to time. The first infested worms were found among a lot collected in the field June 15.

On June 12, 1916, Pollenia caught in traps baited with banana were put in breeding cages and supplied with moist earth and banana for food. Eggs were found on the soil June 19, and we have had no trouble during the summer in obtaining fertile eggs from flies caught in traps. Isolated pairs of Pollenia (bred specimens) failed to oviposit, so that the preoviposition period has not been determined and the number of eggs laid by each female is unknown. The eggs are laid singly, partly hidden in cracks in the soil. Our records show that they hatch about three days after deposition during the summer.

The first stage larvae of *Pollenia* are very active and seem to be able to penetrate the worm at almost any point in the body wall. The point of entrance is not limited to the male genital opening, or to any natural orifice. In worms on which larvae were placed by us, we found them entering the seventieth, sixty-fourth, fiftieth and thirty-fifth segments. Infested worms collected in the field have also shown cases where the larvae have

entered segments far back of the clitellar regions.

We have found no indications of a dormant period during which the larvae remained practically motionless in the body cavity of the worm. Of course, we have been working with summer generations, but our examinations during the Fall of 1915 and Spring of 1916 failed to show any over wintering forms of the larvae.

Our records of summer generations indicate the following developmental periods.

Egg stage	days
Larvae stages	days
Pupal stages	days
Total developmental period	days

From our records on the seasonal prevalence of Pollenia, considered in the light of our studies on the developmental stages. we reached the tentative conclusion that there are four broods or generations per annum in the latitude of Washington. Large fly traps baited with banana were in operation throughout the season and the contents were killed, sorted, and counted each week. We found small numbers of *Pollenia* in these traps from the 1st of April to the middle of May at which time they almost completely disappeared. The wings were frayed and the yellow hairs rubbed off and they had the appearance of old flies which had overwintered. Then we found freshly emerged flies from May 25th on, the number gradually increasing until the maximum was reached during the week ending June 22, followed by a sudden drop. Then another gradual increase began, culminating in another maximum during the week ending July 27. This was repeated and the curve shows another marked rise culminating in the week ending August 31. We expect to find this year, as was found in 1915, another marked rise in October. It seems probable that the adults of this late generation emerging during October and November overwinter in protected situations and deposit eggs during the following April. The fact mentioned above, that infested worms were not found during the autumn or early spring, indicates that this generation does not deposit eggs in the fall. The possibility of pupae overwintering in the soil is yet to be investigated.

More complete studies are now under way upon which we hope to report in detail later.

ANNOUNCEMENT

Separates of all the important papers published in the Proceedings of the Entomological Society of Washington and a number from other journals are for sale at approximately two cents per page (no article less than ten cents). They can be had by applying to the Corresponding Secretary of the Entomological Society, U. S. National Museum, Washington, D. C. No receipt will be mailed for the sale of printed matter unless especially requested.

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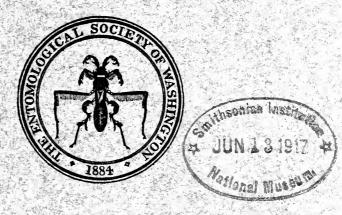
PROCEEDINGS

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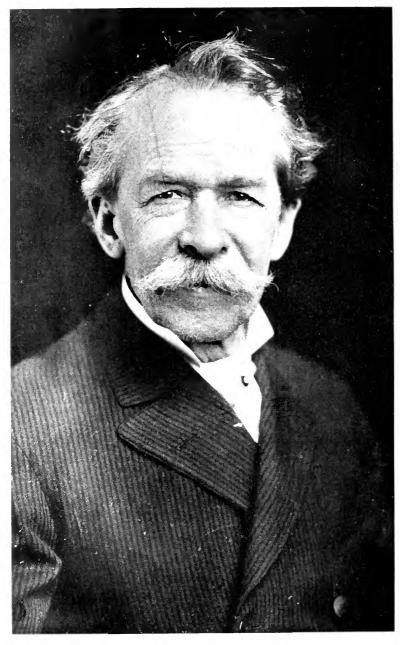
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Otto Beidemann.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVIII	1916	No. 4

It is again our sad duty to chronicle the death of an ex-president, Otto Heidemann, of whom we publish in this number of the Proceedings an appreciation, a biographical sketch and bibliography, together with a short posthumous paper illustrated with a plate of Mr. Heidemann's inimitable drawings.



Otto Beidemann.

By the death of Otto Heidemann on November 17, 1916, our society lost one of its oldest and most valued members. many respects he was a remarkable man; taking up Entomological studies late in life—well beyond fifty—he rose in a few years to the rank of an authority on his chosen group, an achievement which would have been impossible for one less gifted. With a natural aptitude for systematics and a ready grasp of the larger problems of scientific investigation, he combined a painstaking carefulness of small details, untiring energy and the trained eve and skilled hand of the artist. Many excellent illustrations of insects bear witness to his ability as an engrayer. One of these, adorning the cover of our proceedings and adopted as the official seal of this society represents the adult male of Rheumatobates rilevi Reuter and is the only authentic record of a fully winged male of that peculiar insect in existence. His collection of local Hemiptera, is a splendid model of what an modern insect collection should be and shows his exacting care for correctness in even the smallest details. He was a man of broad culture, a peer among the leading contemporary Hemipterists, a writer of plays in both German and English, several of which have achieved public performance, a scientific artist of the very first rank and an earnest student of the social problems of our day. More than all he was a man of lovable and unimpeachable character, ever ready to help others, gentle, cheerful and unassuming to the point of humility. Respected by all who knew his work, loved by all who knew him personally.

A BIOGRAPHICAL AND BIBLIOGRAPHICAL SKETCH OF OTTO HEIDEMANN.

By L. O. Howard, E. A. Schwarz and A. Busck.

Otto Heidemann was born in Magdeberg, Germany, on September 1, 1842. At the age of seventeen he secured a position with the publishing house of F. A. Brockhause at Leipzig, where he learned the art of wood engraving, following this profession for the next three years in various cities in Southern Germany. At the close of the Franco-Prussian war he came to America and established an engraving office in Baltimore, moving to Washington in 1876. During the next few years he furnished illustrations for a number of Government publications. In 1880 he entered the office of Captain G. Wheeler's Geographical Survey as a topographical draftsman. In 1883 he was appointed engraver for the U.S. Department of Agriculture, which position he held for twelve years. During this time he furnished many excellent engravings of economic insects for the Government publications. Through this work he naturally became interested in insects, and during the early nineties under the guidance of his friends Albert Koebele, E. A. Schwarz and Theodore Pergande began the serious study of Entomology. In 1898 he entered the Bureau of Entomology as an Entomological assistant and specialist in Hemiptera. From then on his advance was rapid and in a few years he had risen to the position of a recognized authority in this order and has earned the esteem of such specialists as Uhler, Bergroth and Reuter. He was appointed Honorary Custodian of Hemiptera in the Insect Division of the U.S. National Museum in 1907 and presided over the Entomological Society of Washington for two terms (1909-1910). At the time of his death he was also a member of the Biological Society of Washington, of the American Association of Economic Entomologists, a charter member of the Entomological Society of America and a fellow of the American Association for Advancement of Science.

He is survived by his wife, Mica Heidemann, well known as a sculptress and maker of insect models.

The following is a list of his Entomological publications:

- Note on the occurrence of a rare Capsid, near Washington D. C. F.g. 4, 1891, Proc. Ent. Soc. Wash., vol. 2, no. 1.
- Note on the food-plants of some Capsidae from the vicinity of Washington, D. C., 1892, Proc. Ent. Soc. Wash., vol. 2, p. 224, no. 2.
- A new species of Tingitidae. 1899, The Canadian Entomologist, vol. xxxi, p. 301, no. 10.
- Gargaphia angulata Heidemann. 1909, Bull. 23, N. S., Dept. Agri., p. 33.

- Papers from the Harriman Alaska Expedition, xiii. Entomological results (7), 1900, Proc. Wash. Acad. Sci., vol. 2, p. 503, 506.
- Heteroptera of the Expedition by O. Heidemann. Harriman Alaska Expedition, 1904, vol. 8, p. 141-144.
- Notes on Aradus (Quilnus) niger Stal. 1901, Proc. Ent. Soc. Wash., vol. 4, no. 4, p. 389.
- Remarks on the Spittle Insect, Clastoptera xanthocephala Germ. Pl. vi, 1901, Proc. Ent. Soc. Wash., vol. 4, no. 4, p. 399.
- Papers from the Leland Stanford Galapagos Expedition, 1898–1899;
 Entomological Result: Hemiptera. 1901, Proc. Wash. Acad. Sci. vol. 3, p. 363–370.
- Notes on Balonochilus numonius Say. 1902, Proc. Ent. Soc. Wash., vol. 5, no. 1, p. 11.
- Some insects from the summit of Pike's Peak, found on snow, by A. N. Caudell. (Hemiptera by O. Heidemann.) 1902, Proc. Ent. Soc. Wash., vol. 5, no. 1, p. 80–82.
- Remarks on Ligyrocoris constrictus Say and description of Perigenes fallax, a new species. 1903, Proc. Ent. Soc. Wash., vol. 5, no. 2, p. 155-157.
- Remarks on the genitalia of Podisus cynicus Say and Podisus bractatus Fitch. Fig. 1, 1904, Proc. Ent. Soc. Wash., vol. 6, no. 1, pp. 9-10.
- Notes on North American Aradidae, with descriptions of two new species. 1904, Proc. Ent. Soc. Wash., vol. 6, no. 3, pp. 161-165.
- Notes on a few Aradidae occurring north of the Mexican boundary. 1904, Proc. Ent. Soc. Wash., vol. 6, no. 4, pp. 229-233.
- Description of a new Anasa from North America. 1905, Proc. Ent. Soc. Wash., vol. 7, no. 1, p. 11.
- A list of Capsids from the state of New York, with the description of a new species. 1905. Journ. N. Y. Ent. Soc., vol. 13, p. 48-50.
- A new genus and species of the hemipterous family Ceratocombidae from the United States. Fig. 21, 1906. Proc. Ent. Soc. Wash., vol. 7, no. 4, pp. 192-194.
- Account of a new Tingitid. Figs. 2-3, 1906, Proc. Ent. Soc. Wash., vol. 8, nos. 1-2, pp. 10-13.
- Three new species of North American Aradidae. 1907, Proc. Ent. Soc. Wash., vol. 8, no. 3-4, pp. 68-71.
- Notes on Heidemannia cixiiformis Uhler and other species of Isometopinae (Hemiptera-Heteroptera). Fig. 7, 1908, Proc. Ent. Soc. Wash., vol. 9, no. 1-4, pp. 126, 130.
- Two new species of North American Tingitidae. Pl. iv, 1908, Proc. Ent. Soc. Wash., vol. 10, 10, 1-2, pp. 103-108.
- Naw species of Tingitidae and description of a new Leptoglossus (Hemiptera-Heteroptera) with illustrations, 1909, Bull. Buffalo. Soc. Nat. Sci., vol. 9, p. 231–238.
- Two new species of North American Aradidae (Hemiptera, Aradidae)
 Fig. 3-4, 1909, Proc. Ent. Soc. Wash., vol. 11, p. 189-191.

- Remarks on some Hemiptera species. 1910, Proc. Ent. Soc. Wash., vol. 12, p. 45-47.
- New species of Leptoglossus from North America. (Hemiptera, Corcidae) Pl. 7, 8, 1910, Proc. Ent. Soc. Wash., vol. 12, p. 191–197.
- Description of a new Capsid, fig. 3, 1910, Proc. Ent. Soc. Wash., vol. 12, pp. 200-201.
- 28. Some remarks on the eggs of North American Species of Hemiptera-Heteroptera. 1911, Proc. Ent. Soc. Wash., vol. 13, pp. 128-140, figs. 1, 2, 3, pl. 1, 2, 3, 4.
- A new species of North American Tingitidae, fig. 4, 1911 Proc. Ent. Soc. Wash., vol. 13, pp. 180-181.
- Descriptions of two new species of North American Tingitidae, 1913.
 Proc. Ent. Soc. Wash., vol. xv, no. 1, pp. 1-4, fig. 1, 2.
- The Sugar-Cane. Tingid from Mexico. Fig. a, Journ. of Economic Entomology, vol. 6, no. 2, 1913, pp. 249-251.
- 32. O. M. Reuter. 1912, Proc. Ent. Soc. Wash., vol. 16, no. 2.
- A new species of North American Tingitidae (Corythuca solani). 1914,
 Proc. Ent. Soc. Wash., vol. 16, no. 3, fig. 1.

POSTHUMOUS.

 Two new species of Lace-bugs. 1917, Proc. Ent. Soc. Wash., vol. 18, pp. 217; pl. 17.

Two Hundred and Ninety-Sixth Meeting, June 1, 1916.

The 296th meeting of the Society was entertained by the married members at the Saengerbund Hall on June 1, 1916.

There were present, Messrs. Baker, Barber, Böving, Busck, Craighead, Ely, Greene, Hooker, Jennings, Keeley, Knab, Kotinsky, Middleton, Paine, Pierce, Quaintance, Rohwer, Sasscer, Schwarz, Shannon, Snyder, Speare, Walton and Wood, members, and R. M. Fouts, J. N. Knull, H. F. Loomis and D. G. Tower, visitors.

The Corresponding Secretary read the following resolutions which had been approved by the Executive Committee.

Resolved that all the papers which are for publication in the Proceedings of the Entomological Society of Washington and are presented at a regular meeting on the regular program shall be handed to the Corresponding Secretary on the night of the meeting at which they are presented.

And be it further resolved that copies of short notes or discussion of papers that are for publication and are presented at any

regular meeting of the Society shall be handed to the Corresponding Secretary as soon after the meeting as possible and before the twentieth of the month.

Under the head of "Short Notes and Exhibition of Specimens," the following were presented.

NOTES ON A SOUTHERN TRIP.

By W. DWIGHT PIERCE.

While on a recent trip through several states of the south a few miscellaneous observations of more or less interest were made.

In company with Mr. J. D. Smith I made a very long automobile trip through southwestern Georgia and was especially struck by the abundance of insect-catching plants. A short distance north of Coolidge we stopped at a swamp and made a few notes on these plants and their fauna. Five forms of Sarracenia were observed, the most abundant being S. psittacina Michx., S. catesbaei Ell., and S. minor Walt., the tallest and most conspicuous of which is S. catesbaci. As we approached the water at almost every stop we were likely to tread upon one or more of the little red pads of the Drosera rotundifolia L. The tall spikes of the pretty pink flowers of the *Drosera filiformis* Raf. were also abundant. Here on a very small area were five and possibly seven species of plants specialized as insect-catchers. The species of Sarracenia catch their prey in the pitcher-like leaves which are lined with downward pointing hairs. The Drosera rotundifolia has a little flat pad with viscid knobbed hairs which close in on an entrapped insect. It is hard to conceive that Drosera filiformis belongs to the same genus as it has tall slender tentacles with viscid knobbed hairs which become covered from base to tip with insects. There was not time to make a thorough collection of insects from these various plants but a few notes were

Practically every pitcher of Sarracenia catesbaci contained Lachnosterna, and we found several chrysomelids, coccinellids, two species of lampyrids, several Oncometopia and many flies as prey. Usually the insect prey were very much decomposed and offered plentiful food for large sarcophagid larvae found very commonly feeding on them. This plant was quite commonly skeletonized from the inside by larvae of a lepidopteron which seems to eat everything it finds in the pitcher and pupates in the midst of its damp excrement in a cell made for the purpose.

In the pitchers of Sarracenia minor we found legs of Orthoptera and a few other fragmentary insects. There were numerous live ants evidently preying on the food of the pitchers, and we also found several pupae of a tachinid which has since been bred and determined by Prof. J. M. Aldrich as *Senotainia trilineata* Vand.

The opening of the pitchers of Sarracenia psittacina and a similar species are very small and consequently the prey was confined to smaller insects, principally midges although fragments of a water beetle and other beetles were found.

Drosera rotundifolia only appears to catch tiny Diptera and the order seems to represent the principal catch of Drosera fili-

formis.

In a recent paper before the Society I called attention to the fact that *Prionomerus calceatus* Say., mines the leaves of *Liriodendron* and *Sassafras* at Washington. The old Bureau files contain mention of the breeding of this species from the leaves of a *Magnolia* in Florida. It was therefore with considerable satisfaction that I found this weevil mining the leaves of the bay, *Magnolia virginiana* L. at Thomasville and Coolidge, Ga. Although I have found this weevil mining the leaves of *Sassafras* at Clarksville, Tenn., I was unable to find it on this tree or on the *Liriodendron* at any place in southern Georgia although these trees grow side by side with well infested *Magnolia*. I watched for mines on these trees from Albany to Cuthbert, Ga., from Decatur to Moulton, Ala., and around Memphis, Tenn., without results.

The common cowpea weevil was found freely feeding on the terminal buds of cotton at Thomasville and Boston, Ga. Near Albany, Ga., along a roadside by a field which probably had been in cowpeas last year, this species was very common and feeding on the tender stems of *Smilax*, *Ambrosia*, *Sassafras*, *Liquidambar*, *Rubus*, and *Melia*. This note is of interest to show how some of our common weevils of cultivated crops pass the season preceding the development of their natural food plants.

At Decatur, Ala., I was surprised to find the flat galls of *Phylloxera caryae-avellana* Riley (det. A. C. Baker), infested by the larvae of an *Anthonomus*. These larvae have since been bred out and proved to be *Anthonomus hicoriae* Pierce, which was collected originally on hickory at Texarkana, Texas. It has not previously been found breeding. It is interesting to note that several other species in the group with this weevil also breed in

Phylloxera.

In discussing this paper Mr. Schwarz offered some brief remarks on phytophagous Coleoptera the imagoes of which, especially in the earlier part of the warmer season, feed on the foliage of

various shrubs or trees which are not their regular hosts and never oviposit on them. He more especially referred to the Locust Hispa (Chalepus dorsalis); the Tecoma Hispa (Octotoma plicatula); the Strawberry Rust borer (Typophorus canellus); the Grapevine Flea-beetle (Haltica chalybea). Many other cases of this kind could be cited.

NOTES ON HORSEFLIES AS A PEST IN SOUTHERN FLORIDA.

By T. E. Snyder, Bureau of Entomology.

On a recent trip down the east coast of southern Florida I was particularly impressed with the abundance of and annovance caused to both man and beast by horseflies. Early in the morning of May 12, 1916, while riding on the train (Florida East Coast R. R.), between Jacksonville and Miami, Florida, quite a large species of Tabanus entered the train through open doors and windows, in sufficient numbers to cause considerable annovance to the passengers in the cars. This species (as were all the other species of flies) was identified by Mr. C. T. Greene as Tabanus trijunctus Walker. This fly was apparently attracted to the moving train and individuals frequently lit on the window screens of the pullman cars. This tabanid, which has conspicuous greenish to purplish eyes, when living, was later found to be extremely common from Hobe Sound (about 35 miles north of Palm Beach) to Paradise Key, Florida (about 40 miles south of Miami on the mainland).

On May 17 on Jupiter Island, at Hobe Sound, Florida, painters in working on a building found it necessary to use portable smudges of slow-burning smoke-producing material in metal receptacles, in order to work either on the exterior or interior of the house.

In buildings, especially stables, this fly and another species (*Tabanus lineola* Fabr.) were present in large numbers, and usually the dead flies are swept up off the floor and thrown away each day.

The horses and mules are protected by covering them with close-fitting gunny sacking with holes cut for the eyes, reminding one of the cow that fell into the lime pit in "Cranford." These animals would not stand still without this covering, since the flies would swarm over them and the body becomes covered with blood. They can be swept off the bodies of uncovered horses by the hands-full. Horses and mules with only the head covered,

used in drawing the wagons in spraying operations, usually had the benefit of the services of a negro boy whose sole duty was to "swat" the horseflies on their bodies with a broad wooden paddle made of a shingle and to keep a smudge burning.

Tabanus trijunctus was, by far, the commonest species observed

in any locality.

A night-flying species the beautiful pale greenish yellow *Tabanus mexicanus* Linné, was also fairly common at Hobe Sound, specimens being found on the floor in houses in the morning and also being caught flying at 9.30 p.m., C.T. What must be the sensation of the poor animals after enduring these pests all day to find another species is ready to continue the annoyance!

Tabanus trijunctus and T, lineola were also common in buildings and on animals at Miami Beach, Florida, on May 11 to 16. In the city of Miami they were not noted, although not actually

looked for.

From Miami south to Paradise Key the large species (*Tabanus americanus* Forster) was occasionally seen. This species which has beautiful light green eyes, when living, is very active and hard to catch. Like *T. trijunctus*, it is commonly attracted to moving objects, such as trains, automobiles, and wagons along the road.

None of these horseflies were observed in the woods away from the roads.

The species T. trijunctus and T. tineola are stated by residents to be present in large enough numbers to be a pest only for a few weeks during the year, usually during the last of March or early April. This year they are unusually late.

Cats and dogs are greatly annoyed by these flies and become irritable and even sick and thin from their annoyance and by eating them, as they do when they eatch them on their bodies.

In the woods a deer-fly (Chrysops brunneus Hine) is very annoying to man in the daytime. The "yellow fly of the Dismal Swamp" (Diachlorus ferrugatus Fabr.) also occurs in southern Florida, and Mr. C. A. Mosier of Little River, Florida, gave me a specimen he collected at Buena Vista, Florida. Mr. Mosier also kindly gave me specimens of Tabanus atratus Fabr., T. fronto Osten Sacken, and T. birdiei Whitney—the last named species being rare, according to Mr. Greene. Mosquitoes and sand flies were yery troublesome at night on the offshore keys south of Miami. Following is a list of these flies and the locality and date of collection:

Tabanus americanus Forster, Miami, Florida, May 12, 1916; Paradise Key, Florida, May 14, 1916; Buena Vista, Fla. Tabanus trijunctus Walker, Hobe Sound, Jupiter Island, Florida, May 11 and 17, 1916; West Palm Beach, Florida, May 11 and 17, 1916; Miami Beach, Florida, May 11 to 16, 1916.

Tabanus lincola Fabr., Miami Beach, Florida, May 11 to 16, 1916; Hobe Sound, Florida, May 17, 1916.

Tabanus mexicanus Linné., Hobe Sound, Jupiter Island, Florida, May 17, 1916, flying 9.30 p.m., C.T.

Tabanus atratus Fabr., Buena Vista, Florida. (C. A. Mosier, collector.)
Tabanus fronto O. Sacken, Buena Vista, Florida. (C. A. Mosier, collector.)
Tabanus birdiei Whitney, Buena Vista, Florida. (C. A. Mosier, collector.)
Diachlorus ferrugatus Fabr., Buena Vista, Florida. (C. A. Mosier, collector.)

Chrysops brunneus Hine, Miami Beach, Florida, May 12, 1916.

In discussion Mr. Knab said that the great abundance of Tabanidae in a region like Florida, where the larger mammals were generally scarce, is most remarkable, since the females of this family are supposed to be blood-suckers without exception. It would seem that in a region like Florida only a small proportion of these flies could satisfy their appetite for blood.

Mr. Schwarz stated that *Tabanus psammophilus* O. S., discovered by Mr. Hubbard and himself, occurred only on open beaches. They found it at Indian River Inlet, and afterward as far south as Biscayne Bay. It rests upon the moist sand, and being of the same color is observed with difficulty. As no mammals occur on these beaches, and as the flies never occur elsewhere, this species must have peculiar feeding habits.

Mr. Knab spoke of a species of *Tabanus*, possibly the same as the one just discussed by Mr. Schwarz, which he found on a sandy beach near Nassau, Bahama Islands. When frightened it would fly in the manner of a *Cicindela*, but under no circumstances leave the beach. As mammals were originally almost absent from the Bahamas, it seems certain that these *Tabanus* subsist on other food than the blood of warm-blooded animals.

Mr. Knab, referring to Mr. Snyder's use of the term "sand flies," said that this should never be employed by an entomologist. The name is both indefinite and misleading, since it is applied to widely different insects in different localities.

Mr. Walton stated that some local Tabanidae are apparently not attracted to warm-blooded animals at all. One, especially the small, brown species, Tabanus bicolor, Wied., is usually taken in sweeping marshy places. Hine (Tabanidae of Ohio, page 48) mentions this fact and states that "It has not been observed annoying stock." Tabanus obioensis, Hine, is usually taken in similar situations. Both of these species have delicate wings and are evidently weak fliers. Mr. Walton's personal copy of Osten Sacken's Prodrome which is supposed to have come from his library, contains the following manuscript note: Tabanus psammophilus, O.S., "a strictly maritime species and probably never attacking warm-blooded animals," quoted from E. Schwarz, Entomologica americana, Vol. 1, page 109.

ANTS PROTECTING ACACIA TREES IN CENTRAL AMERICA.

By E. A. Schwarz.

A recent paper by E. Wasmann in Tijdschrift voor Entomologie, Vol. 58, 1915, which deals mainly with the ants of the genus Pseudomyrma living in the thorns of the "Bull's-horn Thorn" Acacias in Mexico and Central America, quotes fully the remarkably accurate account of these ants given by Thomas Belt in his intensely interesting book "The Naturalist in Nicaragua." From his own experience in the Canal Zone of Panama and at Tampico, Mexico, the writer can fully corroborate the original observations of Mr. Belt to the effect that the ants effectually defend the acacia trees against the attacks of man, eattle, and insects. No leaf-eating caterpillars, no aphids, nor coccids are seen on the trees; no leaf-cutting ants ever defoliate the same. But there is one coleopteron, a Bruchus, which frequents the flowers to oviposit and develops in the pods of the acacia without being molested by the ants in any of its stages.

At Tampico a dead acacia was found in the midst of a row of healthy trees. The dead tree had lost its leaves and the ants had deserted it. It had the appearance of having been killed by an insect larva boring in the roots and it would seem that the ants are powerless to protect their host plant against the attack of an underground enemy. However, efforts to pull out roots were not successful. A few pieces of the trunk and larger branches were broken off and carried to Washington, where in the course of time the following Coleoptera were bred in addition to the usual number of Hymenoptera parasites: Seven species of Cerambycidae (one cerambycine and six lamiids); one buprestid (Agrilus); and four species of predaceous beetles (one Bothrideres,

one Lathropus, one Trogosita, and one Clerus).

In discussion Mr. Busck stated that the ant inhabited acacia trees were conspicuously green and uninjured by leaf-eating nsects and stock, because they are so jealously defended by the iants. Cattle and horses have learned not to nibble on the leaves of such trees. One insect however appears to be not only permitted to occupy the trees, but seems to be protected by the ants for some reason, namely the wasp *Polybia occidentalis*, Oliv., which build their curious oblong bell shaped clay-nests in the top of these ant trees and apparently nowhere else. It is significant that these wasps have no sting, but rely entirely on the efficient ants for the protection of their nests.

Mr. Busck mentioned in this connection the inter-relations of the birds and the large wasps, which build their nests in the trees occupied by the well known large hanging nests of the social orioles. These wasps sting very severely and aggressively object to the least interference of man; but the birds hop around the nests and severely shake the branches, without arousing the wasps. The birds in this case have a very formidable protection, from man at least, in these wasps.

A NEARCTIC SPECIES OF DOLICHURUS.

By S. A. Rohwer,

Specialist in Forest Hymenoptera, Bureau of Entomology, Washington, D. C.

The genus *Dolichurus* is known to occur in the Palaearetic, Ethiopian, Oriental and Neotropical regions, but until recently no species has been discovered in the Nearetic region. The following species seems to be quite distinct from all the other species of this genus and adds another genus to the American wasps.

Dolichurus greenei new species.

Female.—Length 7.5 mm.; length of the antennae about 5 mm. Clypeus shining, the anterior margin truncate, the basal middle slightly raised; eyes diverging to the clypeus; face and front opaque, granular, immediately below the anterior ocellus a few shallow, scattered punctures; frontal prominence slightly wider than long, the anterior margin truncate; vertex and posterior orbits shining, sparsely punctured; postocellar line somewhat shorter than the ocellocular line; antennae very slightly tapering, the third and fourth joints subequal; pronotum slightly tuberculate posteriorly, medianly with a longitudinal fovcolate suture; notauli

slightly converging posteriorly, not foveolate; mesoscutum granular with a few scattered setigerous punctures; suture in front of the scutellum plain; scutellum shining, the lateral margins with rather small setigerous punctures, the median surface with a very few setigerous punctures; mesepisternum polished with a few small, well defined punctures; dorsal aspect of the propodeum coarsely, irregularly reticulate, medianly with two carinae which are parallel posteriorly but basally form a large hexagonal-shaped area, the posterior and dorsal aspects separated by a sharp carina; the posterior aspect coarsely reticulate; the lateral aspect shining and entirely smooth anteriorly, irregularly striato-reticulate posteriorly; abdomen entirely smooth, highly polished; first intercubitus strongly angulate at about the middle; second and third intercubiti straight and nearly parallel. Black mandibles except apices, apical margin of the clypeus and the margin of the frontal prominence, yellowish white; the last three segments of the abdomen bright red; tarsi and antennae beneath dark piccous; head and thorax with sparse, appressed, gray pubescence; wings slightly dusky, venation brown, stigma and costa dark brown.

Falls Church, Virginia. Described from one female collected September 1, 1915, by Mr. C. T. Greene for whom this species is named.

Type.—Cat. No. 20303, U. S. N. M.

DIPRION SIMILE IN NORTH AMERICA.

By S. A. Rouwer.

Specialist in Forest Hymenoptera, Bureau of Entomology, Washington, D. C.

In June, 1915, Dr. W. E. Britton recorded the European pine sawfly, Diprion simile as occurring in nurseries at New Haven, Connecticut. At this time the determination of this species was tentative and the following note is presented to make this determination authentic. Since making this tentative determination for Dr. Britton we have received additional material from European specialists and have carefully gone over all the European species and studied them in detail, so do not believe that there is any doubt that the insect occurring in our nurseries is the European Diprion simile.

In his annual report for 1916 Dr. Britton states that this species is established in nurseries at five towns in Connecticut; and we have received it in shipments from inspectors in Massachusetts, Pennsylvania and New Jersey but have no record of its having become established in any of these localities. We have, however, received it from one nursery in New York under conditions

which indicate that it is established.

It is extremely interesting to note that all of the specimens which have reached America, are *Diprion simile* in the most restricted sense and that there is very little variation in color or structure among all the adults examined. This may be explained by the fact that practically all the importations have come from Holland (probably from one nursery) indicating that our form is an inbred variety.

RHIZOBIUS NOT RHYZOBIUS.

By E. A. Schwarz

In his "Illustrations of British Entomology," 1831, Vol. 4, Coleoptera, page 373, Stevens erected in a synoptic table of genera the genus *Rhizobius*, whereas, subsequently (l. c., page 396) in the full description of the same genus with indication of the type species he spells it *Rhyzobius*. Since at the same place, Stevens states: "The only indigenous species grows on the roots of plants, whence the name of the genus from the mss. of Leach," it is evident that the spelling "*Rhyzobius*" is merely a typographical or clerical error and that the spelling "*Rhizobius*" should be preferred.

Two Hundred and Ninety-Seventh Meeting October 5, 1916.

The 297th regular meeting of the Society was entertained by Mr. E. A. Schwarz at the Saengerbund Hall October 5, 1916. There were present Messrs. Abbott, Baker, Banks, Borden, Böving, Busck, Caudell, Duckett, Ely, Fisher, Gahan, Greene, Hutchinson, Jennings, Knab, Kotinsky, Morrison, Paine, Pierce, Popenoe, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Snyder, Walton, and Wood, members, and Messrs. Frank R. Cole, Thomas Kehler, Josef N. Knull, and Herman M. Bernelot-Moens, visitors.

The following program was presented:

A NEW SPECIES OF XYLOTRECHUS.

"(Coleoptera: Cerambycidae.)

By W. S. FISHER.

Branch of Forest Insects, Bureau of Entomology.

The following species has been confused in the collections with quadrimaculatus Hald., and the description is presented at this time so that the name can be made available for discussion in economic papers.

Xylotrechus aceris n. sp.

Male: Form and color like quadrimaculatus Hald., but differs from that species in the markings of the thorax in which it resembles convergens Lec. very closely. Head with the two frontal carinae distinct, united at each end and rather widely separated in the middle, the sculpture is very minute, dense and dull, except in an abruptly defined basal band ascending at the sides along the inner margin of the eyes, this band being shining and coarsely punctate. Antennae thick, compact and reaching just a little past the humeri, joints of equal width throughout, the third just a little longer than the first. Thorax as long as wide, coarsely granulate, especially at the middle where the granules become confluent forming short transverse rugae, sides feebly arcuate, slightly sinuate and narrowed near base, a spot in each of the four angles above of sparse white pubescence. Elytra a little more than twice as long as wide, at base a little wider than thorax at middle, sides nearly straight, distinctly convergent from base to apex, the latter obliquely truncate, outer angle acute but not spiniform, color fuscous-black varying to sepia, a narrow inconspicuous band reaching from the scutellum to near the lateral margin at middle, then bent forward along the margin for a short distance forming an acute angle. and another oblique band reaching from the suture near middle to the lateral margin at apical third of sparse white pubescence, surface between these bands, also humeral and apical portions sprinkled with sparse semierect white hairs. Body beneath black, shining, pro- and mesosternum densely and roughly punctate, sparsely clothed with long white hairs, a conspicuous spot on the posterior half of the metasternal episternum, and similar ones upon the lateral posterior margins of the first, second, and third segment of the abdomen, composed of dense short recumbent white hairs; abdomen with punctures very fine and distant, surface clothed with long erect inconspicuous hairs. Legs slender, the posterior femora rather far from attaining the tips of the elytra, sparsely clothed with long erect white hairs. Length 10 to 12 mm.; width 2.5 to 3 mm.

Female: Differs from the male only in the absence of the shining basal band on the head, which is only traceable by the coarser punctures at the base of the occiput in the female. Antennae not noticeably shorter than in the male. The color is somewhat darker than in the male but this is due to the type being a reared specimen and had not fully colored before being killed.

Type-locality: Washington, District of Columbia.

Other localities: Newark, Delaware; Frankford, Kentucky; Charter Oak, Stoverdale, Linglestown, and Highspire, Pennsylvania.

Type and allotype: Cat. No. 20626 U. S. N. M. All paratypes are in the U. S. Nat. Museum except three which are in the author's collection.

Described from five males and eight females; types and two females recorded under Bureau of Entomology Number Hopk.

U. S. 10081r, and reared June 30, 1916, from maple collected by N. T. Hunt, June 2, 1916, at Washington, D. C.; two males recorded under Number Hopk. U. S. 9724, reared July 1, 1912, from red maple (Acer rubrum) collected by F. C. Craighead June 8, 1912 at Charter Oak, Penna.; two females from Washington, D. C., collected in July and August (Hubbard & Schwarz); one male from Frankford, Ky., collected on August 8 (Soltau); one female from Linglestown, Pennsylvania, collected August 2, 1911 on red maple tree, one female from Stoverdale, Pennsylvania, collected August 25, 1911, and one female from Highspire, Pennsylvania, reared July 7, 1910, from Norway Maple (Acer platanoides) limb collected June 14, 1910 by the author. This last record is the one recorded as quadrimaculatus in the author's list of "Cerambycidae from Harrisburg." (1912, Ent. News, XXIII, p. 311).

Paratypes No. 20626c and d from Charter Oak, Pennsylvania, differs from the type by being lighter in color and not having the markings quite as distinct, but this is due to the specimens having been reared and are not fully colored. Paratype No. 20626f from Frankford, Kentucky, differs from the type by having the thorax at the middle equal in width to the elytra at

base.

This species is closely allied to quadrimaculatus Hald., from which it differs by having the four spots on the thorax of sparse white pubescence instead of dense yellow pubescence, by having the antennae shorter, and also by its habit of making galls on maple trees, while quadrimaculatus girdles the branches of various trees similar to that of Elaphidion villosum Fabr.

COLOR DIMORPHISM IN SCHISTOCERCA DAMNIFICA SAUSS.

BY A. N. CAUDELL.

Color dimorphism in the Acrididae is not at all rare but in most cases known to me this phenomenon is common to both adult and immature forms. With the above grasshopper however it appears to be confined to the nymphal stages. The adults of this common locust are always, so far as I have observed, brown in color. The nymphs however occur about Washington in either a bright green color or brown, as in the adult. I have bred numbers of both phases through and find the green color to persist to the last stage nymphs, always disappearing however with the maturing molt.

THE HABITAT OF DORU ACULEATUM SCUDDER.

By A. N. CAUDELL.

On October 3, of the present year a number of specimens of the above insect were taken by Mr. McAtee near Great Falls, Virginia. This record is deemed worthy of publication as this is the first time this earwig has been taken within the bounds of our local fauna. In addition to the several specimens representing both sexes taken on the above date there was a single immature specimen taken at the same spot on August 11th of last year, also by Mr. McAtee.

The exact point of capture of the above material is a small swamp near the Virginia shore of the Potomac River about one mile below Great Falls, some twelve or fifteen miles from Washington. The earwigs occurred on a sedge-like plant growing in the swamp, a situation to require wading to secure specimens. Careful search under bark, beneath chunks, etc., near this vicinity failed to turn up additional material, those specimens swept from the above mentioned sedge-like plants growing in the swamp being the only ones secured.

TWO NEW SPECIES OF LACE-BUGS.

 $(Heteroptera:\ Tingidae)$

BY OTTO HEIDEMANN.

INTRODUCTORY STATEMENT.

This posthumous article has been prepared for publication by Through the kindness of Dr. L. O. Howard, the undersigned. Mr. Heidemann's notes on Tingidae, his favorite family, were turned over to the writer to determine what material among them was suitable for publication. It is with regret that the report is made that description of but one undescribed species was found. and a nearly finished illustration of a second new species. new species are herewith presented. It was Mr. Heidemann's plan to monograph the American Tingidae, and he did have a very thorough knowledge of them. Apparently, however, very little of this fund of information was committed to writing. Heidemann was wholly unselfish and spent so much of his time helping others, that his own work, even that which lay nearest his heart, was neglected and postponed, until, as it turned out, it was forever too late. If the writer may be allowed to record a personal tribute to Mr. Heidemann, he would say that none was ever more generous, with time, advice and assistance, to fellowworkers; this was as true in the case of the veriest beginner as with the experienced specialist. Gentleness and consideration of others were his predominant personal qualities and in all respects his character was without blemish. As a systematist great caution, infinite painstaking, and a high degree of artistic ability have made his published work as satisfactory and reliable as any that has been done.—W. L. MCATEE.

Leptoypha distinguenda n. sp.1 (Pl. 17, fig. 1).

Specimens of this new species might, at first sight, be taken for *L. mutica* Say, but closer observation shows that it is very different.

In L. distinguenda the body is broader, the pronotum is less elevated between the humeri, and the lateral carinae are more prominent. The costal margin is distinct along the whole length of the hemelytron, somewhat reflexed anteriorly and containing there two series of small areoles. In L. mutica however the costal margin is much narrowed anteriorly, contains only a single indistinct series of areoles and is not at all reflexed, posteriorly also it contains a single series of areoles, which are much narrower than those on the corresponding part of L. distinguenda.

This species abounds on witch-hazel (Hamamelis) from early

spring to late in fall.

Type, a female, from Washington, D. C., July 8, 1899. Other specimens are from the same locality June 20, July 28; Rock Creek, D. C., June 20, 1890; Marshall Hall, Md., August 1, 1891, September 3, 1891; Virginia, opposite Washington, D. C., June 15, 1902; [all of the foregoing without collector labels, but probably collected by Mr. Heidemann]; Mount Vernon, Va., April 19, 1904, R. P. Currie. All in collection of U. S. National Museum.

Acalypta grisea n. sp. (Pl. 17, fig. 2).

General color light-brown with the areoles grayish subhyaline. This species differs from A. thomsonii Stal. (Pl. 17, fig. 3), the only recorded American species, in several particulars, of which the most noticeable is the possession of only a single series of areoles throughout the costal margins of the hemelytra. A. thomsonii has more than one series of areoles anteriorly and in the posterior third to half of costal margin.

A. grisea belongs to that section of Acalypta having the three pronotal ridges of nearly equal height, subparallel and extending from posterior margin to the transversely elliptical and small but elevated hood. The central ridge does not form so conspicuous a ridge and apex on the hood as it does in A. thomsonii.

A. thomsonii on the other hand has the lateral ridges very low and the central ridge strong, rising gradually from the point of posterior process

¹ This species may have been distributed to some extent under the ms. name *confusa* an earlier preference to Mr. Heidemann.

of the pronotum to the hood of which it forms the ridge and sharp apex.

From this conformation it results that the front of the pronotum is more strongly sinuate in A. thomsonii than in A. grisea. The anterior angles of pronotum are acute and produced as far as apex of hood in thomsonii; in grisea they are rounded and do not extend as far forward as the hood.

The ridges bounding the discoidal areas are much more elevated in grisea than in thomsonii. For other characters see the illustrations.

Type a male from the Uhler collection, collected under stones at Andover, Mass., in April. Other specimens are from North Carolina and Maryland. All of these are in the U. S. National Museum collection.²

EXPLANATION OF PLATE XVII.

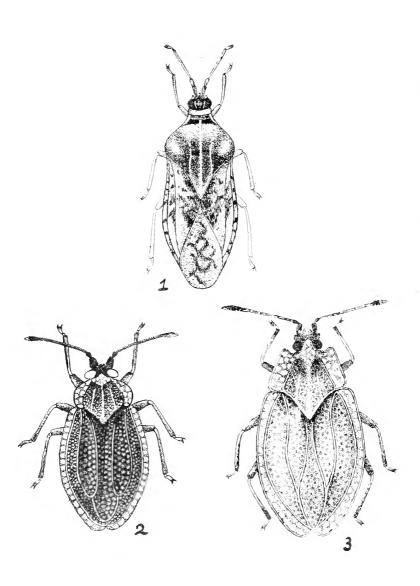
Fig. 1. Leptophya distinguenda n. sp. Fig. 2. Acalypta grisea n. sp.

Fig. 3. Acalypta thomsonii Stal.

²Specimens of A. thomsonii in the same collection are from Massachu-

setts. One bears the Uhler mss. name orbiculata.

⁴It is much more sinuate in A. grisca than is indicated in Mr. Heidemann's unfinished figure. The discoidal areas of hemelytra also are more pointed posteriorly than shown in this illustration.



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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

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1917

Nos. 1-4

Two Hundred and Ninety-Eighth Meeting, November 2, 1916.

The 298th regular meeting of the Society was entertained by Dr. A. L. Quaintance at the Saengerbund Hall, November 2, 1916. There were present Messrs. Abbott, Baker, Barber, Böving, Busck, Caudell, Craighead, Ely, Fisher, Gahan, Greene, Heinrich, Hyslop, Isely, Kotinsky, McIndoo, Middleton, Paine, Quaintance, Rohwer, Sanford, Sasscer, Schwarz, Snyder, Walton, Webb, Wood, and Yothers, members, and T. G. Carnochan, R. M. Fonts, J. R. Horton, Philip Garman, Delmar Webb, and W. W. Yothers, visitors.

The following program was presented.

A NEW GENUS (PERISSARTHRON) OF ELATERIDAE AND A REVISION OF THE AMERICAN ELATERIDAE OF THE GENUS PYROPHORUS, WITH DESCRIPTIONS OF NEW SPECIES,

By J. A. Hyslop,

Bureau of Entomology, Cereal and Forage Insect Investigations,

Perissarthron gen. nov.

(Plate I)

Frontal margin of the head obsolete above insertion of the labrum (fig. a), front concave, labrum moderately broad; mouth directed forward and downward; mandibles eleft at tip; maxillary palpi narrowly securiform; antennae (fig. b), 12 jointed, joints 3 and 4 equal in length; prothorax wider than long, prosternal sutures nearly straight, lateral margins broadly flattened; posterior coxae (fig. c) complete, strongly widened inwardly, but without abrupt angle; tarsi simple, bearing heavy brushes of pile on under surface of joints, tarsal claws (fig. d) simple.

This genus is erected to receive the remarkable species *Corymbites trapezium* of Leconte¹ (Plate I, fig. h), from Texas, of which *Corymbites trapezicollis* Schw.² is a synonym. Schwarz refers this species to the genus *Ludius*,³ so the synonymy will stand as follows:

Perissarthron trapezium (Lec.) Hyslop

Corymbites trapezium Lec. Corymbites trapezicollis Schw. Ludius trapezium (Lec.) Schw. Ludius trapezicollis (Schw.) Schw.

This species has generally been described as having eleven joints with the 11th strongly constricted or appendiculate. This is an error, the so-called constriction really being a distinct segmentation (fig. f), as can easily be demonstrated with a relaxed specimen as the 12th moves freely on the true 11th segment and cannot be compared with the condition of constriction found in certain Melanactes and several species of true Ludius (Corymbites).

Through the kindness of Dr. Skinner of the Philadelphia Academy of Natural Sciences, I have had the opportunity of examining the female of this species in the Horn collection. It differs from the male in the pronotum being as wide at the middle as at the posterior angles, with the sides strongly arcuate. The antennae when directed backward do not attain the posterior angles, consequently joints 4 to 11 are materially shorter in comparison to their diameter than in the male.

The genus will probably fall into the tribe *Ludiini* but its position cannot be definitely ascertained until the larva has been described

Pyrophorus Illiger.

This genus was established by Illiger in 1809 to include those species of the Elateridae having luminous vesicles on the pronotum. This character serves to identify the genus, which is confined to tropical America, both North and South, and the West Indies, with the exception of a few forms which agree with this genus in all characters, save the luminous spots. But one species has been recognized from North America north of Mex-

¹ Proc. Acad. Nat. Sc. Philad., Vol. 18, p. 392, Dec., 1866.

² Deut. Ent. Zeit., 1903.

³ Gen. Ins.

⁴ Mag d Gesellsch, Nat. Freund, Berl. I. p. 141 1809

ico, *Pyrophorus physoderus* of Germar described in 1841,¹ from Alabama.

In examining the material in the National Museum and in the private collections of Messrs. W. M. Mann and Chas. Schaeffer, I have found three more species.

The four North American species can be separated easily upon external characters, but the most conclusive characters for their determinations are in the male genitalia. The following table will serve to differentiate the four species now recognized from North America:

- A. Conspicuous tuberele on base of the pronotum in front of the scutellum.
 - a. Tuberele eonical......texanus sp. nov.
 - b. Tubercle laterally compressed...........arizonicus sp. nov.
- AA. No pronotal tubercle in front of the scutellum.
 - a. Antennae of the male long (when directed backward extending 3 joints beyond the posterior angles). Pronotum usually with decided impressions.............physoderus Germar.
 - b. Antennae of male but one joint longer than the pronotum. No decided impressions on the pronotum, atlanticus sp. nov.

In the North American species the females agree with the males, except that they are usually larger and have the pronotum much broader with its side margins more rounded and the disk much more globose. In all our North American species the antennae of the females are shorter than the pronotum, while in the males they are as long as or longer than the pronotum. Small females occasionally occur and size cannot be considered as a character of much value. I have not examined the female of the physoderus of Germar. In deciding which of the four species from this country is the true physoderus of Germar, the following facts must be taken into consideration: German described the species from Alabama. None of the specimens which I have had opportunity to examine were collected in Alabama, though the series which I consider as physoderus were collected on the Cedar Keys, which are on the upper inner gulf coast of Florida not very far removed from that part of Alabama which reaches the Gulf. Germar distinctly says, in his preliminary analysis of this species, that the antennae are less than one-half the length of the body, while in his further discussion of the species, he says that they are somewhat longer than the prothorax. The species recognized as physoderus in the collections examined, was collected from the east coast of Florida. It agrees with German's

¹ Zeitsch. f. d. Entom. III, p. 36, 1841.

description in being dark brown. However, the antennae in this species are very slightly longer than the pronotum and are certainly nowhere near half the length of the body. On the other hand, the west coast species which I consider the true physoderus of Germar is not as dark brown as the east coast

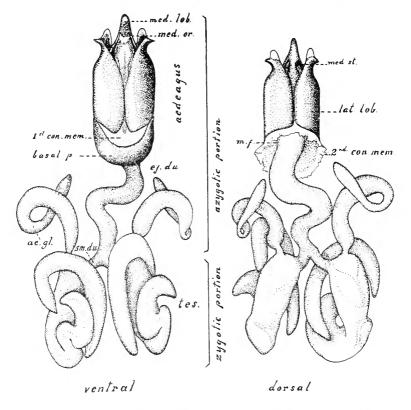


Fig. 1. Dorsal and ventral aspects of the male genital apparatus of Pyrophorus.

species and the antennae of the male are equal to fully one-half the total length of the body. $\dot{\cdot}$

The east coast species, which I have named *Pyrophorus atlanticus*, is entirely lacking the impressed grooves on the disk of the pronotum, which Germar specifically mentions and which are very pronounced in the species from the Cedar Keys. Both of these Florida species lack the basal tubercle on the pronotum.

Candeze in his Monograph places physoderus Germar among those forms having a tubercle at the middle of the base of the prothorax. I believe this to be an error and that the specimen before Candeze was not the physoderus of Germar, but a then undescribed species. He gives the locality as Mexico and Southern United States. To the form which he described, I have given the name Pyrophorus texanus. Germar does not mention the pronotal tubercle in his description of the species and as he mentioned it in several of his other species, I believe that this character alone can eliminate the Arizona and Texas species from physoderus of Germar.

The genitalia of Pyrophorus (Text fig. I) can be divided into

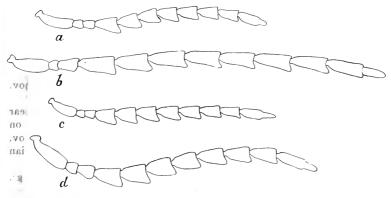


Fig. 2. Antennae of Pyrophorus. a, P. texanus; b, P. physoderus, c. P. atlanticus; d, P. arizonicus.

two parts, the azygotic portion lying anterior to the junction of the seminal ducts and the zygotic portion lying posterior to this junction. The zygotic portion consists of the testes (tes.), the accessory glands (ac. gl.) and the seminal ducts (sm. du.) and is without the scope of this paper. The zygotic portion consists of the ductus ejaculatorius (ej. du.) and of the aedeagus. In most coleopterous males, the azygotic portion is divided into a widened internal sack and a slender stenazygotic portion. In the Elateridae, however, these parts are undifferentiated. The aedeagus is divided into the tegmen and the median lobe. The tegmen consists of a basal, ring-like, articulating plate (basal p.) and two opposed scoop-shaped lateral lobes (lat. lob.), one on either side of the median lobe (med. lob.). The median lobe has a heavily chitinized dorsal part with two median struts (med. st.) on its upper surface and the median orifice (mcd. or.)

on its ventral surface. The sides are membranous and the ventral surface is more or less chitinized. The lateral lobes articulate freely on the basal piece and are connected therewith by the first connective membrane (1st con. mem.). aedeagus is connected with the body wall by the second connective membrane (2nd eon. mem.). The lateral lobes often bear outwardly directed spines and anterior flabellae. The form, number of spines and comparative length and shape of these plates are remarkably constant in all the specimens in the various species of Elateridae examined by the writer and are of decided specific value. The terminology used in this paper is that used by Sharp and Muir¹ in their excellent Memoire on the male genital tube.

The following table will serve to differentiate the four species now recorded from North America as based upon the male genital

characters:

A. Lateral lobes of genitalia with a median, outwardly directed spine in addition to the terminal spine (Plate II, fig. g).

arizonicus sp. nov.

6)

AA. Lateral lobes without median spine.

- a. Sides of the lateral lobes parallel, suddenly constricted near outer fourth: median lobe without ridged depression on upper surface (Plate II, fig. f).....texanus sp. nov.
- b. Lateral lobes gradually attenuated from base to tip, median lobe with prominently margined dorsal depression.
 - 1. Median lobe narrow as tip of lateral lobe (Plate II, fig. c, d, e).....atlanticus sp. nv.
 - 2. Median lobe twice as broad as tip of lateral lobe (Place II, figs. a and b)......physoderus Geric

Pyrophorus physoderus Germ.²

(Plate III, fig. c)

"Piceus, fusco-pubescens, thorace suboblongo, convexo, lateribus autrorsum deflexo, maculis vesicularibus angularibus, antennis corporis dimidio brevioribus, elytris punctato-striatis, apiec muticis. Habitat in Alabama Americae borealis (Gory.).

"Dem P. pyralis verwandt, aber kleiner, dunkler braun, das Halsschild an den Seiten nach vorn tiefer berabgebogen, die Fühler kürzer und die Deckschilde an der Spitze ungedornt. 1

¹ The Comp. Anat. of the Male Gen. Tube in Coleo. Trans. Eng. Foc. Lond. Part III, Dec. 24, 1912. ² Zeit. f. d. Ent. III, p. 36, 1841.

"7–8 Lin. lang, 2¼ Lin. breit, dunkelbraun, mit niederliegenden, graugelben Härchen ziemlich dicht bekleidet, Fühler und Beine heller braum. Kopf ziemlich gross, Stirn etwas länger als breit, wenig eingedrückt, grob punktirt. Fühler etwas länger als das Halsschild, deutlich gesägt, das dritte Glied halb so lang wie das vierte. Halsschild wenig länger als breit, in der Mitte ein halbmal breiter wie der Kopf, der Länge nach gewölbt, die Seiten von der Mitte weg nach vorn niedergebogen und stark nach den Vorderecken hin gerundet, Hinterdornen ast gerade. Im Mittelfelde zwei mehr oder minder tief eingedrükte Grübehen. Die Oberfläche dicht punktirt, mit Spuren einer glatten, etwas erhabenen Mittellinie. Leuchtflecke vor den Hinterdornen, eirund, schief, gleich weit vom Seitenrande wie vom Hinterrande entfernt, am Rande punktirt. Auf der Unterseite ein dreieckiger, gelber, durchscheinender Fleck im Hinterwinkel. Schildehen länglich, an der Wurzel abgestutzt.

"Deckschilde gewölbt, punktirt-gestreift, die Zwischenräume dicht punktirt, die Seiten von der Mitte nach der gerundeten Spitze hin allmählich verengt."

The sides of the pronotum are convergent from the base, practically straight and suddenly narrowed at the apex. The posterior angles are acute and divergent. No pronotal bubercle in front of the scutellum. The disk of the pronotum usually bears four clongate impressions, two near the middle of the disk and two near the base. The luminous vesicles are as near the lateral border as the posterior border of the posterior angles and are distinctly visible from below. The color is reddish brown and the vestiture is grayish yellow and moderately sparse. The elytra are parallel to the posterior third and are not mucronate at the tip. Joint 3 of the antenna is longer than 2, joint 11 is strongly apenticulate, giving the impression of a 12th joint. In the male the antennae (text fig. 2 b) extend 3 joints beyond the posterior angles of the pronotum when directed backward. Antennal joint 3 is not serrate and is decidedly narrower and more like joint 2 than joint 4. Joints 4, 5 and 6 with sides subparallel, twice as long as broad and slightly serrate.

Aedeagus with median lobe very broad rounded at tip, broadly spatulate-concave above at tip, median orifice less than one-half width of median lobe at that point from tip. Lateral lobes attenuate from base to tip, distal spine declivious, compressed. No lateral spine.

Male, 15 to 20 mm. long, 3 to 6 mm. wide.

Specimens examined: 1 3 Florida (Chas. Schaeffer), 6 3 3 Cedar Keys (Hubbard & Schwarz).

Pyrophorus arizonicus sp. nov.1

(Plate III, figs. f, g.)

Sides of the prothorax parallel, strongly rounded anteriorly; posterior angles acute, divergent, carinate with laterally compressed strong tubercle on the pronotum immediately in front of the seutellum; pronotum bearing a pair of longitudinal impressions near the base. Luminous vesicles as near the lateral border as the posterior border of the posterior angles and distinctly visible from below. Color dark reddish brown, vestiture not modifying the color of the integument. Elytra attenuate beyond the middle, the tip not mucronate. Antennal joint 3 longer than 2 and distinctly shorter and narrower than 4; joints 4, 5 and 6 strongly serrate, not twice as long as broad; joint 11 constricted at outer third (text fig. 2 d).

Aedeagus with lateral lobes strongly narrowed at outer third, bearing stout spine on outer side beyond middle. Lateral and distal spines strongly deflexed, lateral lobes moderately densely covered with stout erect hairs beyond lateral spine. Medial lobe strongly narrowed. On outer third narrower than end of lateral lobes, end very slender, concave above; lower chitinized plate of median lobe broader than upper plate, visible from above. Median lobe not deflexed at tip. Median orifice more than four times diameter of lobe from tip.

Male, 22 mm. long, 6 mm. wide. Female, 25 mm. long, 7 mm. wide.

Described from 3 ♂ ♂, 1 ♀ as follows: 1 ♂ (type) Patagonia Mts., Ariz. (U. S. N. M.), 1 ♀ (allotype) Arizona (Chas. Schaeffer), (paratypes) 1 & Ramsay Canyon, Huachuca Mts., Ariz. (W. M. Mann), 1 ♂ Arizona (Chas. Schaeffer).

Tupe:—Cat. No. 20462, U. S. N. M.

Pyrophorus atlanticus sp. nov.

(Plate III, figs. d, e.)

Sides of the prothorax parallel to beyond the middle, then broadly rounded to the apex. The posterior angles acute and divergent, pronotum slightly swollen near the base of the scutellum but not bearing a tuberele, pronotum without discal impressions. The luminous vesieles as near the lateral border as the posterior border of the posterior angles and distinctly visible from below. Color, very dark brown, vestiture short and rather sparse, not modifying the color of the integument. Elytra

¹ Since preparing this manuscript two more specimens of P. arizonicus have been added to the National Museum collection. These were collected on Indian Creek in the Animas Mts., New Mexico, July 23, 1917, by Dr. C. H. T. Townsend.

parallel to the middle, then attenuate to the tips, not mucronate at the tip. Antennae with joint 3 longer than 2 and distinctly shorter and narrower than 4, joints 4, 5 and 6 not twice as long as broad and strongly serrate, joint 11 simply constricted a little beyond the middle (text fig. 2c).

Aedeagus with median lobe attenuate at tip, spatulate concave above, distance between margins of spatula, equal to diameter of lateral lobes at that point. Median orifice the diameter of median lobe, at that point, from tip. Lateral lobes attenuate from base, distal spine small declivious. No lateral spine.

Male, 12 to 17 mm. long, 3.5 mm. to 5 mm. wide.

Female, 18 mm. long, 5.5 mm. wide.

Described from 21 ♂♂ and 2 ♀♀ as follows: Type 1 ♂ Enterprise, Fla. (Hubbard & Schwarz), allotype 1 ♀ Enterprise, Fla. (Hubbard & Schwarz), paratypes 9 ♂♂ Enterprise, Fla. (Hubbard & Schwarz), 2 ♂♂ Crescent City, Fla. (Hubbard & Schwarz), 1 ♂ North Smyrna, Fla. (Hubbard & Schwarz), 1 ♂ North Smyrna, Fla. (Hubbard & Schwarz), 1 ♂ Welham, Fla. (S. S. White), 1 ♂ Samford, Fla. (C. V. Riley), 1 ♂ Indian River, Fla. (Hubbard & Schwarz), 1 ♂ Florida (Hubbard & Schwarz), 1 ♀, 3 ♂♂ Florida (Chas. Schaeffer).

Type locality:—Enterprise, Fla. Type:—Cat. No. 20460, U. S. N. M.

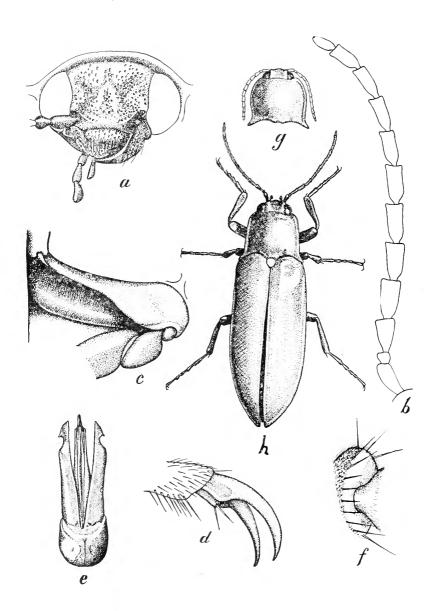
Pyrophorus texanus, sp. nov.

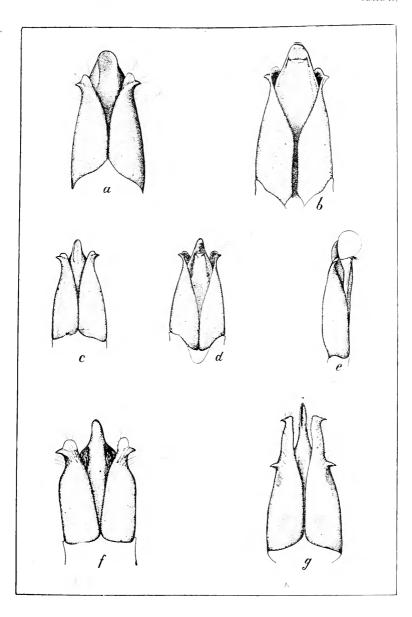
(Plate III, figs. a, b.)

Sides of the prothorax convergent from the base, slightly rounded, posterior angles acute and divergent, prominent conical tubercle on the base of the pronotum in front of the scutellum, the pronotum some times bearing impressions and some times without them. The luminous vesicles as near the lateral border as the posterior border of the posterior angles and distinctly visible from below. Color from pale reddish to almost black, the vestiture dense, grayish yellow and quite long. The elytra attenuate posteriorly and not mucronate. Antennal joint 3 longer than 2, and distinctly narrower and shorter than 4; joints 4, 5 and 6 distinctly serrate and not twice as long as broad; joint 11 simply constricted at outer third. Antennae of the male (text fig. 2 a) little, if any, longer than the pronotum.

Aedeagus with median lobe strongly narrowed at tip, declivious, convex above, median struts visible when lateral lobes are closed. Median orifice twice diameter of median lobe, at that point, from tip. Lateral lobes parallel from base to outer third then suddenly narrowed to tip. Distal spine strongly declivious; no lateral spine.

Female and male, 14 to 19 mm, long, 4 to 6 mm, wide.





Described from 43 & and 3 & an

Type locality:—Brownsville, Tex. Type:—Cat. No. 20461, U. S. N. M.

EXPLANATION OF PLATES.

Plate I. Perissarthron trapezium. a, Anterior aspect of head of σ ; b, right antenna of σ ; c, right coxa of σ ; d, posterior tarsal claws of σ ; c, aedeagus; f, joint between 11th and 12th antennal segments of σ ; g, prothorax and head of φ ; h, adult σ .

Plate II. Male genitalia of *Pyrophorus*. a, dorsum, b, ventron of *Pyrophorus physoderus*; c, dorsum, d, ventron, e, lateral aspect of *Pyrophorus atlanticus*; f, dorsum of P. texanus, g, dorsum of P. arizonicus.

Plate III. Adult Pyrophorus. P. texanus; a, male, b, female; P. physoderus, c, male; P. atlanticus, d, male, c, female; P. arizonicus, f, male, g, female.

NOTES AND DESCRIPTIONS OF SOME ORCHID WEEVILS.

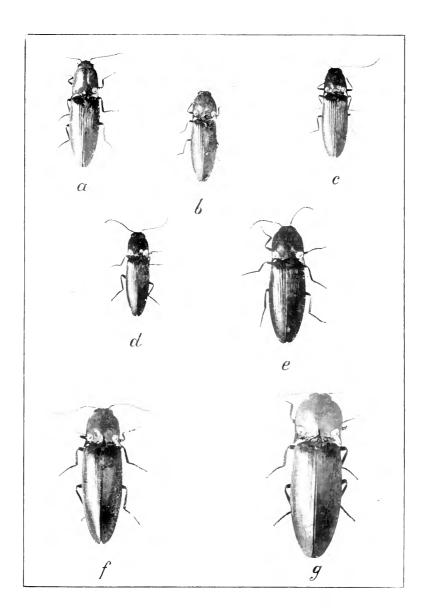
By H. S. Barber.

Bureau of Entomology.

The several notes on Orchid injuring insects that have appeared recently contain references to species not before reported as such and from the study of certain species in the weevil genera Cholus, Acythopeus, and Eucactophagus, it appears to the writer from the specimens and literature before him that certain corrections in the application of the names are necessary. Seven species are treated in this paper three of which are described as new.

Cholus Germar 1824.

Mr. Champion's description in the September number of the Entomologist's Monthly Magazine, of the large black and white orchid weevil, *Cholus cattleyae*, found by Mr. H. B. Weiss in or-





chid houses in New Jersey, came to my notice too late to withdraw my own description of the same weevil from publication in the last volume of these Proceedings and was my first intimation that the species was attracting attention elsewhere.

Mr. Weiss informs me that 17 specimens were found, usually singly on various species of *Cattleya* especially on *C. gigas* during irregular visits to an orchid house at Secaucus, N. J., between May and August of 1916. The adults were quite conspicuous, crawling and feeding on the leaves and bulbs and doing much damage. Their chief injury appears as before stated to be done by the larva developing in the pseudobulbs.

Mr. Weiss has helped me to reassemble all of his specimens except the second one he captured which he sent to Mr. Champion and which became the type of *cattleyae* being most likely now deposited in the British Museum. Five of these sixteen specimens are *Cholus cattleyae* Champ, but the other eleven examples are not that species but are *C. forbesii* Pascoe, this determination having been corroborated from photographs sent by me

to Mr. Champion.

Mr. S. B. Fracker of Wisconsin writes that adults have been taken in the Milwaukee greenhouses in January, March, June, August and September and that larvae were found in all stages during this time, pupation occupying at least two but not more than four weeks and that larvae lived under the abnormal conditions of his office for at least four months without pupating. Two partly grown and two apparently full fed larvae were received alive from Mr. Fracker on September 14; the two smaller ones were here introduced into fresh, artificial holes in the healthy leaf bulbs of a small Cattleya where they apparently made themselves at home and excavated the interior of the bulb, but when the latter were cut open in November both larvae were found to be dead. One of the larger larvae was ready to pupate when received but was unable to cast the larval skin and was preserved September 25; the other took some weeks to prepare for pupation which it accomplished about November 1 and finally issued as an adult November 20, after which it took nearly a week to harden. It lived about two months upon a Cattleya plant which was finally killed by the feeding of the weevil.

Mr. Sanders recently informed me that ten or twelve specimens were preserved from the Milwaukee infestation, but of these the writer has had access to only seven. Thus including the single specimen found in Washington, D. C., in 1913, and the one reared by the writer, these notes are based upon a series of twenty-five specimens which have been assembled through courteous loans from the collections cited below, and the examination of this series is of considerable interest since the three previous de-

scriptions of the two species distinguished in the series, were

based upon a total of five examples.

The idea is forced upon me that the occurrence of the two species in one orchid house in New Jersey accompanied as it is by great variation in size and in prothoracic markings in cattleyae (these markings always being more or less complete elements of the design which is constant in forbesii) and the occurrence of but one of the species (cattleyae) practically without variation in the Milwaukee orchid house indicate the possibility of a more or less recent hybridization under the artificial conditions, which might not be possible in their native habitats, and which may have superimposed the pronotal vestiture of forbesi to a varying degree upon the supposedly more dominant form and sculpture of cattleyae. Until some breeder can make the experiment this supposition should not receive more than casual attention but the probability of such occurrences is constantly confronting us. The native habitat of neither of the two species is definitely known.

Cholus cattleyae Champion (September, 1916)¹

In this species of which C. cattleyarum m. (November, 1916) is undoubtedly a synonym, the variation in vestiture consists in the appearance on an otherwise entirely black prothorax, of various of the elements of the white squamose areas so conspicuous in the following species. Of the fourteen examples before me eight specimens are from the orchid house at Milwaukee, and six of these as well as the specimen found by Mr. Heidemann in 1 13, have no pronotal markings; the Milwaukee specimen reared by the writer displays a pair of postocular squamose patches, or a from the New Jersey orchid house and one from that in Milwaukee have only a small prescutellar spot as described by Champion; one specimen (in Dickerson collection, received from Weiss) displays the prescutellar spot, the pair of postocular spots and also a pair of small discal squamese areas; the preseutellar spot and only one of each of the discal and postocular spots are present in another specimen in the Weiss collection, and only the prescutellar and one of the postocular spots in the specimen Mr. Weiss gave to Mr. Leng; finally a specimen received by the American Museum of Natural History (the first one found by Mr. Weiss and the one which he illustrated, Entomological News) which has two pairs of squamose areas in addition to those just mentioned, one before the humerus, and another above the coxae, all being connected with the prosternal squa-

¹ See Proc. Ent. Soc. Wash., XVIII, Plate XIII, facing p. 178.

mose band, as shown in the figure (Pl. 4, fig. 2). The elytral vestiture is more constant, but in the Washington specimen the white areas although maintaining their position are so reduced in size that the intervening black lines of the striae become obvious and the specimen has a much more tessellate appearance. Six of the Milwaukee specimens are females and measure 10.75 mm. to 12 mm. while the single male measures 10.25 mm. in length (excl. rostr.). The five Weiss specimens measure 8.5 mm. (σ and φ) 9.5 mm. (σ), and 10.5 mm. (σ and φ). The specimens belong in the following cabinets:

U. S. National Museum,—4 specimens (type and paratype of

cattleyarum Bar. and two other specimens from Milwaukee).

Wisconsin Department of Agriculture,—4 specimens (from Milwaukee).

University of Wisconsin,—1 specimen (from Milwaukee).

American Museum of Natural History,—1 specimen (from Weiss).

Mr. Chas. Leng,—1 specimen (from Weiss).

Mr. E. L. Dickerson,—1 specimen (from Weiss).

Mr. H. B. Weiss,—2 specimens.

Cholus forbesii Pascoe 1877. (Pl. 4, figs. 1, 1A, 1B.)

The specimens in our series are narrower and less roughly sculptured than cattleyae, with the tibial and tarsal vestiture composed of intermixed black and white hairs instead of vellow There are no white scales on the mesopleural plates and the specimens display a different series of elytral and prothoracic squamose markings which vary slightly but in general leave, large, black unclothed areas as follows:—A large elongate discal black spot occupying nearly half the length of the suture, and often with lateral extensions near its posterior end; a large threelobed, discal black spot on the pronotum which encroaches slightly on the elytral base on each side of scutellum and is usually narrowly produced anteriorly to join the black head; a pair of post-humeral round spots of about the same size as one of the lobes of the pronotal macula; a pair of subapical lateral spots apparently the same size in the dorsal aspect but produced downward and forward to include the posterior coxae; and finally the

¹ Mr. Champion writes that in the type the white scales of the pronotum are more extended partly enclosing three bare patches on the disc, and from a rough diagram accompanying this statement it appears that the prescutellar squamose patch is produced forward and joins with in ward extensions of the transverse squamous band at basal third of pronotum, leaving the anterior nude area triangular and the basal pair quadrate.

short common, apical clytral black spot. In addition to these there is a small lateral, prehumeral spot on the thorax, usually encroaching a little onto the base of the clytra and sometimes connected with the discal spot; in front of it are two small lateral spots of which the lower is very small but present in all specimens. The metasternum is clothed with white scales as in cattleyae and the abdominal sternites are similarly clothed, except that the patches on the second segment fuse into a continuous transverse band.

The eleven specimens $(5 \circlearrowleft \circlearrowleft, 6 \circlearrowleft \circlearrowleft)$ before the writer (and six specimens of *cattleyae*) were all taken by Mr. Weiss in an orchid house at Secaucus, N. J., during the past summer, and have generously been loaned (except of course the type in the British Museum) from the following collections:

Mr. H. B. Weiss,—7 specimens labelled "Bergen Co., N. J.," two of which are retained for the National Collection, by the

kind permission of the owner.

Mr. E. L. Dickerson,—2 examples labelled "Secaucus, N. J., VIII."

Mr. A. C. Frost,—1 example.

American Museum of Natural History,—1 example.

The notices of these orchid *Choli* known to me are as follows:

- 1877 Paseoe (Proc. Ent. Soc., Lond., 1876, p. XXX, named and gave short diagnosis of *Cholus forbesii* from a specimen found among some supposedly Ecuadorian orchids at Highgate, England.
- 1903 Champion (Biol. Centr.-Amer. Coleop., vol. IV, pt. 4, p. 306, pl. XVI, figures 12 and 13) describes and figures two new species, C. nigronotatus from Nicaragua and Panama (two specimens), and C. nigromaculatus from Panama (a pair) the first of which he compares with Pascoe's species.
- 1906 Champion (l.c., p. 724—footnote) corrects an error in above.
- 1916 Champion (Ent. Mo. Mag. (3), vol. 2, Sept., p. 201) describes a new species. *C. cattleyae* from a specimen found by Mr. Weiss breeding in bulbs of *Cattleya gigas* in a New Jersey greenhouse. A photo of the same species from Milwaukee, Wis., is cited and the three preceding species are mentioned.
- 1916 Barber (Proc. Ent. Soc. Wash., vol. 18, p. 177, pl. 13) figures and describes the Milwaukee specimen as C. cattleyarum.
- 1916 Fracker (Wisconsin Horticulture, vol. 7, Oct., p. 27) records the occurrence of Cholus cattleyae (without using a name) in orchid houses in Milwaukee.
- 1917 Weiss (Ent. News, vol. 28, p. 28, pl. V, fig. 2) describes the injury in greenhouses by C. cattleyae and C. forbesii and figures the specimen of the former species now preserved in the American Museum of Natural History.

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1917 Sanders and Fracker (Wise. Dept. Agric. Bull. 10, pp. 54-56, fig. 15) report their observations on Cholus cattleyae in Wisconsin.

1917 Weiss (Ent. News, vol. 28, p. 218) lists Cholus cattleyae and C. forbesii from New Jersey.

Acythopeus Pascoe 1874.

This genus was erected for a group of small barids having the rostrum greatly enlarged anteriorly at base and separated from the front by a deep transverse incision. The three species here referred to do not display this character but I am unable to place them among more agreeable companions and expect their segregation as new genera may become necessary. No recent allusion to Centrinus epidendri Murray? 1869 which was believed to have been bred from orchids, or to Apotomorhinus orchidearum Kolbe 1906 (which appears to be closely allied to, or synonymous with Acythopeus aterrimus Waterhouse 1874) has been found but I cannot now ascertain if they are in reality allied to the specimens before me.

Acythopeus gilvonotatus n. sp. (Pl. 4, figs. 3, 3A)

Type:—Cat. No. 21067, U. S. National Museum.

Pieeous, the humeri and legs paler; opaque strongly alutaceous; coarsely foveolately punctate; elytra ornamented with a double posthumeral and two subbasal, discal, convex masses of yellow scales; femora unarmed. Head with front feebly impressed between the eyes which are separated by the width of the beak; front shallowly foveolate, each impression with a small silvery scale at center. Beak (from frontal impression) twofifths as long as length of specimens, only slightly more curved in basal half than apically where it is slightly flattened, broader, and finely punctate; punetures almost contiguous at middle of upper surface, becoming longitudinally confluent at sides, forming a conspicuous sulcus above the scrobes with a secondary imperfect sulcus separated from it by broken irregular carinae, the individual punctures being only distinguished by the silvery scale of each. Antennal scape almost reaching the eye, distant from it by about one-third the length of the first funicular joint; first of the seven joints of funicle as long as two of the following joints which gradually increase in width until the seventh is twice as wide as the second; elub elongate oval, as long as the three preceding joints and a little wider than the seventh. Pronotum seven-eighths (Q) to ninetenths (5) as long as wide, widest at middle, sides straight and feebly convergent posteriorly, are nately convergent anteriorly, surface strongly alutaceus between the coarse, rather closely set squamiferous fovea. Elytra five-eighths to two-thirds as wide as long, widest just behind humeri, sides almost parallel in basal half; striac deeply confluently punctate at base, the punctures more shallow and widely separated on the

disc; intervals flat with a median row of fine squamiferous punctures, the second, fourth, sixth and eighth intervals broader than their alternates and bearing two or three large seales, most of the punctures bearing only minute scales; second interval clothed at basal fourth with a small oval prominent mass of dense yellowish scales, fourth interval with a larger mass of similar scales which nearly reaches the base of the elytra, sixth and eighth intervals with similar but smaller masses, a little posterior to the others and almost uniting over the much constricted seventh interval. Legs sparsely clothed with silvery scales each of which is set in a shallow fovea, the femora relatively stout and unarmed, the tibiae with inner edge straight and apex strongly hooked. Length 3 to 3.6 mm., width 1.3 to 1.6 mm.

Habitat unknown.—(probably Philippine Islands).

Described from two specimens (σ and \circ) found among Philippine orchids in the Executive greenhouses, Washington, D. C., in November, 1906, and one (σ) found on *Phalaenopsis* in a greenhouse in Bergen County, N. J., by Mr. H. B. Weiss in 1916.

This species does not belong in Apotomorhinus Schoenherr 1844 nor in Acythopeus Pascoe 1874, both of which have a frontal incision at the base of the rostrum, and differs from A. aterrimus (Waterhouse) 1874 and from A. orchivora (Blackb. 1900) in the unamed femora, straight tibiae, as well as in sculpture and vestiture, but since Champion 1913 and 1916 includes these latter species in this genus "for the present" the species here described may as well also be assigned here. The writer hopes the two species aterrimus and orchivora are correctly determined in the material before him but is unable from the literature to satisfy himself on this point. Yet, since the species appear to have never been contrasted, though several times compared, he offers the following vague characters of habitus which may aid in their recognition.

A. orchivora (judging from three specimens received under this name from H. B. Weiss from the same set as the specimen mentioned by Champion 1916) is smaller, more robust, darker colored (piceus black) and more shining (owing to slightly larger and more prominent polished rugosities on the outer margin of the pronotal punctures and on the anterior margin of the interstrial series of minute elytral punctures) and has the humeri slightly more prominent with basal end of eighth stria more deeply impressed. Length $2.7 \ (\ \)$, $3 \ (\ \ \)$ and $3.3 \ (\ \ \)$ mm.

A. aterrimus is larger, more elongate, rufopiceous and less shining, the pronotal punctures deeper and relatively more close-set, punctures of eighth stria moderately impressed, interstrial series of polished rugosities relatively finer and all the striae relatively broader. Three specimens found on Philippine orchids in the

Executive greenhouses in 1906 were determined as this species some years ago by Mr. E. A. Schwarz and measure 3.2 (φ), 4 (φ) and 4.1 (\varnothing) mm.

A summary of the papers encountered by the writer in this investigation which may prove useful in its continuance by others is appended, but he has included the 1844, 1859, 1866, and 1874 citations only because of possible systematic usefulness, since no relationship of these weevils with orchids is indicated in them:

- 1844 Schoenherr (Gen. et Sp. Curculionidum, vol. 8, p. 258) erects the genus Apotomorhinus (type A. submaculatus).
- 1844 Boheman (in Schoenherr, I.e., pp. 259-260) describes A potomorhinus submaculatus and cribratus n. spp. from Manilla and Pondiehery.
- 1859 Walker (An. Nat. Hist. (3), vol. III, p. 264) describes A potomorhinus albo-ater n. sp. and A. signatus n. sp. from Ceylon.
- 1866 Lacordaire (Gen. Coleop., vol. 7, pp. 226-7) redescribes A potomorhinus Schoenh, correcting the number of funicular joints from 8 to 7 and citing the two species of Walker 1859 as apparently not belonging to this genus.
- 1869 Murray? (Gardner's Chronicle, 1869, p. 1279) describes *Centrinus epidendri* (apparently a new species) believed to attack softhearted orchids such as *Epidendrum*. (See remarks by Rye in Zool. Record, vol. 6, pp. 280–281.)
- 1874 Pascoe (Journ. Linn. Soc. Zool., vol. 12, Feb., pp. 61-63) describes a new genus *Acythopeus* containing five new species, two of which are figured (pl. 3, figs. 11, 11 a and 17).
- 1874 Waterhouse (Ent. Mo. Mag., vol. 10, March, p. 226) describes Baridius aterrimus n. sp. from Singapore, where it was "destructive to Phalaenopsis and other orchids," and believes the species should enter Pascoe's just published genus Acythopeus.
- 1900 Blackburn (Trans. R. Soc. S. Austral., vol. 24, pt. 2, p. 61) describes Baris orchivora n. sp. bred from stems of a Queensland orchid (Dendrobium sp.) at Sidney (Froggatt).
- 1904 Froggart (Agr. Gazette, N. S. W., vol. 15, p. 517, and plate facing p. 514, fig. 2) notes the infestation of the pseudo-bulbs of Dendro-bium from which he had taken the specimens described as Baris orchirora by Blackburn 1900. The work, larva, pupa and adult are described briefly and the adult is figured.
- 1906 Kolbe (Gartenflora, vol. 55, pp. 2-6) describes Apotomorrhinus orchidearum n. sp. from cultivated orchids (Phalacnopsis) believed to come from the Malayan Islands but makes no allusion to earlier papers.
- 1906 Lea (Trans. R. Soc. South Austral., vol. 30, p. 101) compares a specimen of aterrimus received from Waterhouse with what he believed to be orchivora and reported them undoubtedly identical. The assignment to the genus Acythopeus is strongly criticized but

- he did not feel justified in proposing a new generic name for the species.
- 1912 Swezey (Proc. Hawaiian Ent. Soc., vol. II, no. 4, p. 168) notes A. aterrimus as established in an Orehid house in Honolulu and also as taken from orchids imported from Manila, citing Froggatt's 1904 illustration and alluding to Lea's 1906 synonymy.
- 1913 Champion (Ent. Mo. Mag. (2), vol. XXIV, p. 33) records the capture of Baridius aterrimus in a flower of Catasctum splendens at Kew and eites specimens from other English conservatories. The species is assigned for the present to Acythopeus Pasc, but differs in having toothed instead of unarmed femora and the intermediate tibiae toothed in the ♂. Froggatt's (?) statement that B. orchivora Blackb, is a synonym is denied but the two species are said to be closely allied.
- 1916 Champion (Ent. Mo. Mag. (3), vol. II, p. 200) eites Baridius orchirora as found on flowers of Dendrobium in New Jersey by Mr.
 Weiss and assigns this species with Baridius aterrimus whose
 food records he reviews, to the genus Acypotheus Pase. (typ. err.
 for Acythopeus). Diorymellus laevimargo n. sp. is described from
 specimens received from H. B. Weiss in New Jersey and from a
 specimen found attacking orchid roots in a greenhouse at Ithaca,
 N. Y.
- 1917 Weiss (Ent. News, vol. 28, pp. 26-28, pl. 5, figs. 3 and 4) reviews the accounts by Blackburn, 1900, and Froggatt, 1904, of Acythopeus orchivora and records its frequent occurrence and injury in orchid houses in New Jersey. The abundant occurrence of Diorymellus lacvimargo and the injury by the adults is described and the adults of both weevils are figured.
- 1917 Weiss (Ent. News, vol. 28, p. 106) corrects Acypocheus to Acythopeus.
 1917 Weiss (Ent. News, vol. 28, p. 218) again eites Diorymellus laevimargo and Aenthopeus orchivora, as found in New Jersey.

Eucactophagus Champ. 1910.

Five species of this genus are in the National Collection, two of which appear to be new and are here described. The other three were determined by Mr. Champion and are mentioned in his 1910 work (Biol. Centr.-Amer., Coleop. vol. IV, pt. 7, pp. 96–100. pl. IV, figs. 31–35a, and pl. V, figs. 1–3a). The genus does not appear homogeneous and the species may not all be orchid feeders but as two species have now been taken in American greenhouses with the inference that they issued from imported Orchids, we may expect other species to appear also. The six species included in the Biologia are all well figured and the seventh species, the genotype, is illustrated with its original description. Photos of two new species are here given although a drawing of one of them has been published by Weiss 1917.

Eucactophagus graphipterus Champion 1910.

As stated in a footnote to the description of this species, Champion's third specimen was found in a greenhouse in Connecticut by Dr. Britton and is in our National Collection. I have seen no other specimen but the type and paratype localities are Costa Rica and Colombia. The large vellow area of the elvtra covers the basal two-thirds and bears a round brown spot at middle of suture which reaches the third stria, a pair of similar spots just behind middle extending from fifth stria to margin and a faintly rufous area at basal fourth between third and fourth striae. The identification of the form treated by Weiss 1917 as this species was made by Mr. Schwarz about 1914, from a single specimen which he then supposed was only a variant of graphipterus but a series of specimens subsequently taken in the New Jersev orchid houses and received from Mr. Weiss vary but little among themselves and are conspicuously distinct from Champion's species. Since I have failed to find a description with which it agrees it becomes necessary to propose a new name for the species that has troubled the New Jersey orchid growers.

Eucactophagus weissi n. sp. Pl. 4, figs. 4, 4A, 4B.

E. graphipterus Weiss 1916 (Journ. N. Y. Ent. Soc, xxiv, pp. 93 and 147), 1917. (Ent. News, vol. 28, pl. 5, fig. 1) nec. Champion. Type:—Cat. No. 21068, U. S. N. M.

Very similar to graphipterus apparently differing from it only in the elytral coloration, deeper elytral striae and in the pygidium being slightly more strongly earinate with coarser punctures. The elvtra are principally translucent yellow in color, the suture, base, and posthumeral third of side margin narrowly margined with black, the black margin becoming broad on the humerus and side margin behind the middle, and occupying the apical fourth of the elytra. The striae are more deeply engraved with larger and deeper punctures which show the black ground color through the yellow chiton; interstices more convex and clear yellow except for rufous or piceous spots situated as follows: second interval with a piceous area twice as long as wide at middle of length of elytra, third and fifth interval with a similar spot at basal fourth which sometimes merge into one but both are sometimes very pale, the fifth also has a second black or brown spot just behind the middle. The yellow coloring is produced a little further backward in intervals 2, 4 and 6. Length 13-17 mm., width 5.5-7.5 mm.

Habitat unknown (probably tropical America).

Described from five specimens $2 \circlearrowleft \circlearrowleft 3 \circlearrowleft 2$, taken in orchid houses at Summit, N. J., by Mr. H. B. Weiss, the type dated April 27, 1914, paratypes in the collections of Mr. Weiss and Mr. Chas. Leng.

Eucactophagus biocellatus n. sp. (Pl. 4, fig. 5.)

Type:—Cat. No. 21069, U. S. N. M.

Very similar to *E. aurocinetus* Champ, but conspicuously different in that the yellow area occupies the basal three-fourths of the clytra except the humerus and encloses a piecous macula occupying third, fourth and fifth interstices just before middle of clytra. The strial punctures are more deeply impressed and the interstices more convex than in *aurocinetus*. The first stria is arcuate basally and joins the second stria beside the scutellum. The third interstice is twice as wide at base as the fourth, the seventh interstice but little more than half as wide throughout its length as the others. The antennal scape is stouter basally and less swollen apically, and is feebly arcuate in basal half. Length 10 mm., width 4.8 mm.

Described from a single specimen received about 1912 from F. H. Jackson at Las Cascades, Canal Zone, Panama. The black discal elytral spots occupy part of the area occupied by the yellow fascia in the cotype of *aurocinctus* illustrated by Champion which is before me (U. S. Nat. Mus. Cotype No. 21070), so it is improbable that it might be merely a form of that species with the yellow fascia more extended.

EXPLANATION OF PLATE IV.

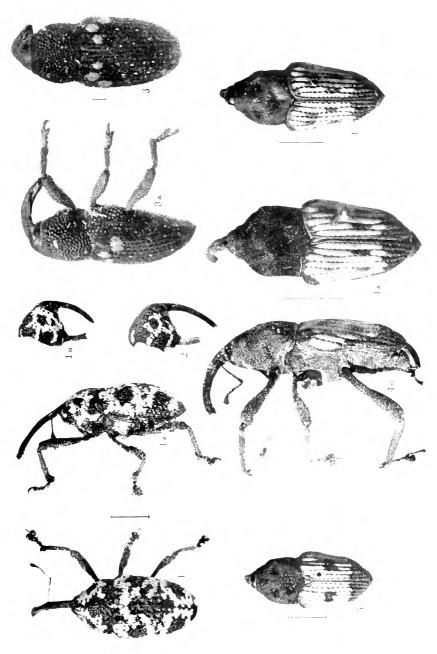
- 1, 1A, 1B. Cholus forbesii Pascoe.
- 2. Cholus catteleyae Champ. Abnormal specimen (perhaps hybrid) in collection of Amer. Mus. Nat. Hist., displaying thoracic vestiture as in C. forbesii. For normal coloration see plate facing p. 178, Proc. Ent. Soc. Wash. 1916.
 - 3, 3A. Acythopeus gilvonotatus n. sp. Type. (Photo. by Paine.)
 - 4. Eucaetophagus weissi n. sp. Type.
- 4A, 4B. " " Largest paratype. (Dark lines on abdomen and metasternum of 4B are shadows of legs.)
 - 5. Eucactophagus biocellatus n. sp. Type.

THREE NEW TACHINID PARASITES OF ELEODES.

By W. R. Walton,

Bureau of Entomology, U. S. Department of Agriculture.

The three forms described below constitute an addition to our knowledge of the dipterous parasites of the imagines in Coleoptera. Two of them represent a well marked genus, apparently new to science. The remaining form is a true *Biomyia*, a genus already known as being parasitic on adult beetles. The American species





known to have this habit are *Biomyia qeorgiae* B. and B., and B. *lachnosternae* Town., *Euhalidaya (Biomyia) genalis* Coq., described by me as E. severinii, and parasitic on *Diapheromera* (Orthoptera) is of course not a *Biomyia* in any sense but represents, in my opinion, a valid genus very close to *Holidaya* of Egger.

Eleodiphaga new genus.

Moderately robust, head (pl. 5, fig. 1) large, wider than thorax, distinctly conical, much thicker at insertion of antennae than at vibrissae. Wings rather short, legs robust.

Front abruptly produced, antennae inserted distinctly above the middle of eye, face sloping downward in a gentle convex curve to vibrissae which are inserted slightly below the oral margin. Cheeks equal in width to at least two-thirds height of eye. Front at vertex nearly twice as wide as eye, the vitta occupying one-third or more of its width. The frontalia thickly sprinkled with macrochaetae. Parafacials more than half as wide as facial depression, their lower half plentifully sprinkled with irregularly arranged bristles. Facial depression deep, its sides almost parallel, carina nearly obsolete. Fascialia bearing bristles on approximately the lower two-thirds. Antennae, in the male, very long, first two segments elevated above the level of the front, third segment slightly longer than the face, its long sides nearly parallel, at least six times longer than broad and of a velvety texture. Arista inserted at extreme base of third segment and thickened to its tip, second joint only slightly longer than broad. Vibrissae short, rather weak, not decussate, and directed downward. "Transverse depression" of face not transverse but running almost vertically from corner of eye to oral margin, the cheeks proper merging immediately with inferior occipital surface. Eves absolutely bare, small and oval in shape. Frontal macrochaetae arranged in two rows, the upper ones not noticeably stronger than the lower, descending well below insertion of arista. No true orbitals present in male. Occilar bristles well developed and widely divergent but directed forward. Ocellar triangle unusually large. Proboscis very short, fleshy; palpi, normal. Wings (pl. 5, fig. 2) with the apical cell long-petiolate, ending in the costa, well before tip of wing, the petiole about twice as long as small crossvein. Costal spine obsolescent but distinguishable. All veins bare excepting base of the third which bears two or three ordinary bristles. Front claws of male not elongated, the hind tibiae coarsely pectinate but not ciliate, with coarse bristles. The tarsi all rather small and weak.

This genus seems to be related to both *Phasmophaga*, Town., and *Hyperecteina* (Admontia)—Schiner.

Type of the genus, $E.\ caffreyi$ new species.

Eleodiphaga caffreyi new species.

Length 9 mm. male. Black, subshining; wings milky, nearly opaque; veins black. Front, face, cheeks and occiput black, thinly pruinose, with grayish pollen. Vitta brownish. Antennae and aristae black, palpi reddish. Postocellar pair of macrochaetae present. Thorax black, thinly grayish pollinose, two pairs of indistinct vittae present, postsutural dorsocentral bristles three, stepnopleurals four or more, pleurae black, thinly whitish pruinose. Scutellum black, bearing three pairs of marginals and an apical pair. Abdomen ovate, conical, black, shining, entirely destitute of pollen or spots. Median diseal and marginal macrochaetae on all segments excepting the first which bears neither. Venter black, hypopygium retracted but visible, shining black. Middle tibiae bearing one weak and two strong macrochaetae on front side toward the middle. Legs black including coxae, squamae opaque white.

Described from two male specimens, one reared from material collected by D. J. Caffrey of the U. S. Bureau of Entomology, at Maxwell, New Mexico, (elevation 6,500 feet) and in honor of whom the species is named. The specimen emerged from an adult of *Eleodes extricata* Say. The other specimen was reared from material collected by V. L. Wildermuth, at Prescott, Arizona, and emerged from an adult of *Eleodes obsoleta*, Say.

Eleodiphaga pollinosa new species.

Length 9 mm. Similar structurally to the foregoing species, differing as follows: slightly more robust, the front (pl. 5, figs. 3-4) produced not quite so much, eyes longer, antennar somewhat more slender, arista a little shorter. The palpi yellow and rather small. First two joints of antennae yellowish red, third joint brownish, entire head more thickly pollinose. Thorax and scutellum opaque, whitish pollinose, five dorsal vittae plainly visible, the middle one obsolete cephalad of the transverse suture.

Dorsocentral macrochaetae four, acrostichals strong and in four pairs, sternopleurals four or more. Abdomen robust, ovate, first three segments black, the basal two-thirds silvery pollinose, the margins shining, fourth segment orange yellow, thinly silvery pollinose at base. First segment without median macrochaetae, the intermediate segments with weak discals and marginals, fourth segment bearing only weak bristles on its disc and the marginals also rather weak. Legs black, claws short, hind tibiae subciliate, middle tibiae bearing a single macrochaeta on front side near the middle. Wings milky hyaline, veins blackish, third vein bearing three weak bristles at its base. Tip of both wings broken off in holotype about, opposite the hind crossvein, remains of wings very similar to E. caffreyii

Described from a single male specimen reared from an adult of *Elcodes hispilabrus* Say, collected at Maxwell, New Mexico, by D. J. Caffrey.

Biomyia eleodivora new species.

Length 10 mm., male, slightly elongate in form, ashy gray opaque, wings fusco-hyaline. Head (pl. 5, fig. 5) of the true *Biomyia* form. Antennae inserted slightly above middle of eyes. Front sloping upward from root of antennae to vertex, is about one-half as wide as width of eye. Vitta occupying approximately one-half of front, black in color.

Parafacials, parafrontals, occipital border and facial depression silvery gray pollinose. Frontals descending to tip of second antennal joint, orbital bristles absent. Antennae dark brown, very slender, the third joint a little more than twice as long as the second. Arista longer than antennae, very slender, thickened only at extreme base. Palpi and proboscis reddish. Vibrissae long, slender and projecting at right angles to plane of face, inserted well above oral margin. Cheeks ashy gray covered with rows of fine black hairs. Thorax and scutellum rather thinly ashy gray pollinose. Five vittae visible, the middle one obsolete cephalad of the transverse suture. Posterior dorsocentrals four; they are unusually long and slender and nearly erect. Acrostichals in three pairs. Sternopleurals three, pleurae thinly cincreous pollinose. Abdomen entirely opaque, rather thinly cinereous pollinose and slightly marmorate. A distinctly median, blackish vitta visible from behind. Venter concolorous with abdominal dorsum. Hypopygium visible, black and bearing a few fine hairs. All segments of abdomen bearing median marginals, no true discals apparent on any segment. Legs remarkably robust, black, all, and especially the hind metatarsi, noticeably swollen (figs. 7 and 8). Hind tibiae not ciliate nor pectinate but bearing a few scattered macrochaetae. Front claws elongated. Wings (pl. 5, fig. 6) slightly fuscous, the veins brownish. Squamae white.

Described from one male specimen reared from an adult of *Eleodes tricostata* Say, collected by J. S. Wade, at Holdredge, Nebraska. The species is closely related to *B. lachnosternae* Town., but is evidently quite distinct.

Explanation of Plate V.

Elerdiphaga caffreyi.

Fig. 1. Head of male.

Fig. 2. Wing of male.

Eleodiphaga pollinosa.

Fig. 3. Side view of head.

Fig. 4. Front view of head.

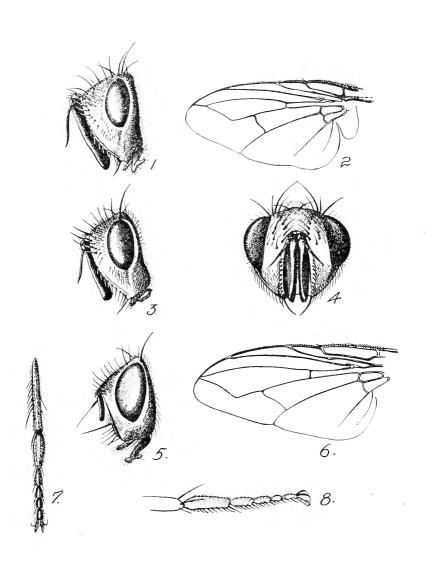
Biomyia eleodivora.

Fig. 5. Side view of head.

Fig. 6. Wing.

Fig. 7. Hind tibia and tarsus, dorsal view.

Fig. 8. Lateral view of hind tarsus, showing spiny armament of ventral surface.



Two Hundred and Ninety-Ninth Meeting,

DECEMBER 7, 1916.

The 299th regular meeting of the Entomological Society of Washington was entertained by Dr. W. D. Hunter at the Saengerbund Hall, December 7, 1916. There were present Messrs. Baker, Busck, Cole, Crawford, Cushman, Ely, Gahan, Garman, Gibson, Greene, Heinrich, Hunter, Hyslop, Kotinsky, Middleton, Morrison, Paine, Pierce, Rohwer, Sasscer, Schwarz, Snyder, Speare and Walton, members, and Messrs. J. J. Davis, Harry F. Dietz, R. M. Fouts, F. H. Gates, visitors.

The president announced the death on November 17 of Mr. Otto Heidemann, a valued member and ex-president of our Society. He also stated that he had appointed Messrs. Schwarz, Howard and Busck a committee to draw up suitable resolutions.

Mr. Schwarz gave some exceedingly interesting reminiscences of Mr. Heidemann's early life as an entomologist and member of the Society. Mr. Rohwer told something of Mr. Heidemann's connection with the Society, stating that he had designed the cut of the official seal of the Society. Mr. Rohwer stated that he had received resolutions of condolence from the Cambridge Entomological Society.

Mr. Busck also gave some interesting reminiscences of Mr. Heidemann's private life.

Messrs. E. H. Gibson and F. R. Cole of the Bureau of Entomology, and Dr. Philip Garman of the Maryland Agricultural College were elected to active membership.

The following officers were elected:

President, C. R. Ely.

First Vice-President, E. R. Sasscer.

Second Vice-President, Frederick Knab.

Secretary-Treasurer, S. A. Rohwer.

Recording Secretary, A. B. Gahan.

Editor, J. C. Crawford.

For members of the Executive Committee, Messrs. W. D. Hunter, A. L. Quaintance, and A. N. Caudell.

Mr. Hunter was nominated to represent the Society as a vicepresident of the Washington Academy of Sciences. Under the head of "Notes and Exhibition of Specimens" the following was presented:

NOTES ON THE IMMATURE STAGES OF HEMITAXONUS MULTICINCTUS ROHWER.¹

BY W. B. HALL.

The following observations were made from material collected on a cultivated fern bed in Wakeman, Ohio. The ferns in this bed were transplanted from their native haunt which is on the banks of the Vermillion River, near Wakeman, Ohio.

From certain upchecked tests it seems that this species can be

only partially controlled by hellebore.

Host.—Athyrium thelypteroides (Michx.) Desv.

Egg.—The eggs are attached on end to the upper side of the leaf, often as many as ten or twelve on a frond. They are smooth, shining, honey-yellow, about 1 mm. long by 0.5 mm. broad. Before hatching the young larva can be observed through the transparent egg shell. Incubation varies from 50 to 60 hours.

Oviposition.—From observations in 1914 it appears that ovi-

position occurs about May 22.

Larva.—Light green with black spots on the head and a light line along each side of the body. On hatching it is about 2 mm. long and when through feeding, about 10 mm., long. In the rearing cages the feeding stage is 11 to 12 days. [The last feeding stage larvae preserved alcohol have a large brownish spot on the anal plate, the vertex, occiput and front medianly brownish, and a blackish spot behind the eye. They correspond closely with the larva of dubitatus var. amicus as described by Dyar.] There is only one generation a year.

Natural enemies.—The House Wren (Troglodytes domesticus) feeds on the larva. It was interesting to watch a pair of wrens, which had their young in a bird house near by, earry the larva to their young. They would dart in among the fronds, catch their prey, and fly away to their nest. One female made 5 trips

in 3 minutes.

[In the same vial with larvae is a single Dipterous puparium indicating that this species is parasitized by some fly.]

¹ Remarks enclosed in brackets have been supplied by Mr. S. A. Rohwer.

THREE HUNDREDTH MEETING,

January 4, 1917

The 300th regular meeting of the Society was entertained by Mr. E. A. Schwarz at the Saengerbund Hall, January 4, 1917. There were present Messrs. Ainslie, Back, Baker, Böving, Busck, Caudell, Cole, Cushman, Dietz, Duckett, Ely, Fink, Gahan, Garman, Gibson, Gill, Greene, Heinrich, Howard, Hunter, Hutchison, Isely, Johansen, Kelly, Kotinsky, Marlatt, Middleton, Morrison, Pierce, Popenoe, Ransom, Rohwer, Sanford, Sasscer, Schwarz, Simanton, Snyder, Turner, Walton, and White, members, and K. B. Brown, J. A. Corcoran, W. E. Dove, Henry Fox, Seymour Hadwen, Leale F. Howard, H. G. Ingerson, U. C. Loftus, visitors.

Mr. James C. Evenden, Bureau of Entomology was elected a corresponding member.

Mr. J. S. Wade, of the Bureau of Entomology, and Mr. Harry F. Dietz, of the Federal Horticultural Board, were elected active members.

The chair announced the death January 2, 1917, of Mr. John F. Strauss, a member of the Society.

The following program was presented:

A REVISION OF THE NORTH AMERICAN GRACILARIIDAE FROM THE STANDPOINT OF VENATION.

By C. R. Ely.

The writer has for some time been interested in the genus Gracilaria and its allies. The appearance of Meyrick's Revision of the Gracilariidae was therefore very welcome. It was a matter of some surprise that, in this revision, the character of the vestiture of the legs was made of chief importance in delimiting genera and that less emphasis than usual was placed upon venation. It is not intended, in this paper, to combat the deliberate opinion of Mr. Meyrick, in regard to what character is of most importance within this family, but it is believed that the publication of a classification of our North American forms, from the standpoint of venation, may be made to serve a useful purpose,

in calling attention to certain facts concerning the species of a geographically restricted group. For the study of the Gracilariidae along broader lines Meyrick's comprehensive work must be consulted.

The careful study of wing venation requires the complete denudation of the wings and it is therefore evident that unique types could not always be satisfactorily examined. In the fol-

lowing article all such exceptional cases will be noted.

The general characters of the Gracilariidae, so far as the venation is concerned, are given by Meyrick as follows: "Forewings lanceolate or very narrowly elongate; 1 b simple, cell long, two-thirds to three-fourths of wing, 2 from toward lower angle, 4 usually from angle, 7 to costa, 8 usually separate or absent, 11 from about one-third of cell or near base or absent, upper margin of cell usually obsolete on basal third. Hindwings one-half to two-thirds, lanceolate or linear cilia 2–8; 1 c absent, cell open between 4 and 5, 5 and 6 often stalked, 6 and 7 approximated anteriorly or seldom stalked."

This characterization holds good of all North American species, so far as observed, which are now listed in this family. I would add that, with the list of species now under consideration, I a is usually absent and I c weak, when present, in the forewings, and that, in the hindwing, 6 is invariably stalked with 5 when both are present. In regard to the anal veins it would appear that 1 b, which so often preserves the fork at the base, in other families, should be the strongest vein and the last to disappear. There seems to be a general tendency to eliminate both 1 a and 1 c, with 1 c the more persistent of the two. In the hindwings it is

Metriochroa Busck¹ shows 6 stalked with 7 in the hindwing, but with a complete separation between 5 and 6, and for these reasons is not included in this paper. It is said by Meyrick to be allied to *Tischeria*. I am informed by Mr. Busck that there is some probability that the larva of another insect was described under this genus, as the collected material shows but one larva answering the published description, and two others which

are typical gracilariid larvae, according to Heinrich.

usually difficult to discern any anal vein whatever.

Eucosmophora Walsingham is also not included in this paper. Meyrick states that Walsingham's description of the reduced neuration was incorrect and places this genus under Acrocercops. He does not however give a description of the true neuration, which is unknown to me. The species sideroxylonella Busek is therefore listed provisionally under Acrocercops.

¹ Busck, Proc. U. S. Nat. Mus., Vol. XXIII, p. 245, 1900.

The hindwings of the Lepidoptera taken as a whole, except the Micropterygidae, from which all the genera in this family are believed to have been derived, are characterized by a very simple neuration along the costal area of the wing. Two branches only were formerly supposed to remain, 7 terminating near the apex and 8 reaching the costal margin nearer the base. In a paper read by Busck before this Society in 1909¹ attention was called to the fact that the genus Cycnodia Herrich-Schaffer has three branches to the costa, vein 7 having two branches to the costa near the apex. At this time the author of the paper proposed the erection of a superfamily to be called the Cycnodioidea, to include genera descended from this nine veined ancestor. A few years ago the present writer's attention was called to some peculiarities in the venation of Ornix, as shown in Stainton's figures in Vol. III of the Insecta Britannica. Further investigation, with the assistance of Mr. Busck, showed the existence of species of both Ornix and Gracilaria which appeared to possess an extra. or 9th, vein in the hindwings. These facts were interpreted by Busck² as confirming the belief in the separate family rank of the Gracilariidae a belief which had formerly rested almost wholly upon larval characters. It may be pointed out in this connection that Cycnodia, as noted by Busck, while derived from a form having nine veins in the hindwing, does not show the same type of neuration as Gracilaria. In Cycnodia it is a vein near the outer portion of the wing which has persisted, while in Gracilaria it is one near the base of the wing. Judging from the position of vein 11 in the forewing it is probably the homologous vein which has been retained in the hindwing. Spuler³ in his excellent figures shows this vein, and the interpretation appears to be the same, in regard to which vein has persisted, though he treats the matter somewhat differently. This interpretation if correct would seem to indicate that the family under consideration is an old one, instead of recent as stated by Meyrick.4

The hindwing of a species of the genus Gracilaria presents a type of venation which is fairly constant within the genus, and is more or less closely approached by other genera within the family. The most striking characters appear to be the open cell, between 4 and 5, and the relation existing between 7 and 8. Vein 8 reaches the costa not far from the base, where it fuses with it at a point where the costa drops sharply downward, producing the characteristic hump with which the hindwing in this

Busck, Proc. Ent. Soc. Wash., Vol. XI, p. 92.
 Busck, Proc. Ent. Soc. Wash., Vol. XVI, p. 52, 1914.

³ Spuler, Schmet. Eur., Band 2, p. 410, 1910.

⁴ Meyrick, Gen. Ins., 128, p. 3, 1912.

family is provided. Vein 7 is quite close to 8, and parallel with it, until it reaches a point near the hump, where it curves downward, approximating 6, with which it is usually connected by a cross vein, and then slants upward toward the outer extremity of the costa. The extra vein, when present, may be found arising out of 7, just under the hump, or at times connected by a cross vein with 8. In most of the later forms however this extra vein has disappeared. The changes which take place in the various genera, when a degradation of the neuration takes place in the hindwing, are apparently quite simple. The extra vein is usually the first to be lost, followed by 4 and then usually by 3, although sometimes 3 appears rather to become transformed into a continuation of 2. Of the branches 5 and 6 it is probably 6 that is the first to disappear. The median vein (5, 6) and 7 tend to approximate one another until they may culminate in the form found in *Phyllonorycter*, and its allies, and anastomose anteriorly.

In the forewing there are several features which are thought to particularly noteworthy. In Acrocercops, Parornix and Parectopa it will be seen that the position of 11 is, at the point of its origin, much farther removed from the base of the cell, and that the system of veins 10 to 7 is much more advanced along the costal margin of the cell, than is the case with Gracilaria. In the latter 10 arises much nearer the base than 2 while with the former genera the contrary is the case. There seems to be in the later development, in this family, a crowding of the veins toward the apex of the wing, and the formation of a more or less pointed outline at the anterior margin of the cell, when any veins have been lost in this region. This may perhaps be accounted for by the fact that in many species possessing a complete neuration the outer wall of the cell is weak. of veins takes place by means of the usual methods, obsolescence or stalking. In the costal series 11 and 7 may disappear by obsolescence or, in the case of 7, by stalking with 8. Of veins 8, 9 and 10 no tendency to disappear was noted, that is to say none of these veins was observed while in the act of disappearing, either by obsolescence or by stalking. In the case of several genera with much degraded neuration, where there were no intermediate forms, Meyrick's diagnosis was accepted and vein 8 stated to be absent. In the dorsal series 2, and possibly 6, may disappear by obsolescence. In Gracilaria there is a tendency toward simplification by the stalking of 4 and 5, while in Parornix, Parectopa and Acrocercops there is a tendency to simplify by means of the stalking of 6 with 5 or 7, and accompanying it the loss of veins 2 or 3.

It may be stated that the venation of Apophthisis Braun could not be studied, owing to lack of material, and that it is placed in the list of genera according to my interpretation of the figure¹

accompanying the original description.

The obsolescence of vein 2 in the Gracilariidae appears not to have been noted by Meyrick and is not in conformity with his generic descriptions in several cases. When but one vein is absent in the dorsal series, he invariably specifies 3 as the one which has been eliminated. In authentic European specimens of Acrocercops brogniardellum Wallen., in the collections of the U. S. Nat. Museum, I have found that vein 2 was obsolescent while 3 remained strong. The same fact was observed in the case of Dialectica Wlsm, and Chilocampyla Busek. In the species strigifiniletta and salicifoliella there is a weakening of 2 but in these cases 3 tends to disappear also. I may add that in the original description of Chilocampyla Busck² 3 was stated to be absent, while it may easily be seen, by the figure accompanying the description, that no veins are missing, but that 2 is disappearing and is the one which was overlooked.

It may be well to take up at this point some discrepancies which have been noted in reviewing Meyricks Revision of the Gracilariidae and which show the need of accurate figures to accompany verbal descriptions. In the case of Leucanthiza³ Clem., it is stated that 5 and 6 are stalked in the hindwings, while the figure of the venation of this genus, Fig. 29 (b), shows that vein 6 is absent. In this case as with Chilocampyla Busck, mentioned above, the figure is correct while the description is not. In regard to the genus Epicephala Meyr. 4 there is a similar disagreement. It is here stated that vein 3 of the forewing is absent while the figure 21 a shows all 12 veins to be present. In this case the writer is unable to judge whether the figure or the description is correct. The only figure given of a species of the genus Gracilaria is that of G. alchimiella Scop. which shows 5 and 6 stalked, in the hindwing, and the stalk arising out of 7, a type of venation which I have been unable to find in any of the North American species of Gracilaria, and which does not appear in any of the European forms examined, including surinaclla, elongella, stigmatella, auroguttella and alchimiella. The presence also of I a in the forewing is certainly not normal as I have been unable to find it in any of the species examined.

The task of revising the Gracilaviidae of the world must have been very difficult and one which no one but Mr. Meyrick was

 ¹ Braun, Can. Ent., Vol. XLVII, p. 490, fig. 20, 1915.
 ² Busck, Proc. U. S. Nat. Mus., Vol. XXIII, p. 248.
 ³ Meyrick, Gen. Ins., 128, p. 12, 1912.

Meyrick, Gen. Ins., 128, p. 12, 1912.
 Meyrick, Gen. Ins., 128, p. 13, 1912.
 Meyrick, Gen. Ins., 128, fig. 24b, 1912.

competent to undertake. It is not surprising however, considering the magnitude of the undertaking, that a few of our North American species are not properly listed. In the following pages the genera will be taken up in the order given by Meyrick and the reasons given for all changes which have been made.

The list of species under *Lithocolletis* has not been revised. This group has been so carefully studied by Miss Braun that, in the list of species which follows this paper, the arrangement given in her Revision will be followed. The only exception made is the listing of *Cameraria* Chapman, and the use of *Phyllonorycter* Hb. instead of *Lithocolletis* Hb. As to *Cameraria*, it would seem illogical to object to a division based upon larval characters, within a family whose family rank rests mainly upon a characteristic structure in the larval stage. One species only may be noted here, on account of the fact that it has the abnormal habit of forming its, cocoon outside the mine. Upon examining the venation of this species, *ostensackenella* Fitch, it was found that the venation is abnormal, the two veins nearest the apex of the forewing arising from a short stalk from the tip of the cell.

Porphryroscla Braun is retained as a good genus as it is believed that it should not be dropped without further investigation.

Several species, noted later, were transferred from other genera and placed under *Marmara* Clemens. *Aesyle* Chambers, is removed from its position, as a synonym of *Acrocercops*, and made a synonym of *Marmara*, as *fasciella* Ch., the type species, belongs to this genus.

Under Acrocercops Wallengren, the writer has placed only those species which correspond rather closely to the type species brogniardellum Fabr. It is believed that Meyrick's conception of this genus is much too broad and that the group as listed by him will eventually be broken up. An additional reason for this restriction of the genus is the fact that in albinatella Ch. we have a species which corresponds generically in practically every detail with brogniardellum. It may be noted here also that Mevricks very broad definition of the genus Acrocercops does not cover the venation of the type species, broaniardellum, which has 5 and 6 of the forewings stalked, the other veins remaining separate. This fact is also recorded by Stainton, in regard to the relation of 5, 6. The following species were removed from under Acrocercops, because they did not fall within the limits of Acrocercops, under Meyrick's definition: schastianella Busck, transferred to Gracilaria, from an examination of mounted wings, forewing not denuded; fasciella, to Marmara on venation; strigifinitella was

⁴ Stainton, Ins. Brit., Vol. III, Pl. 6, fig. 11a, 1854.

made the type of a new genus; randiella, made the type of a new genus; renustella transferred to Leucospilapteryx Spuler; bereasella Clem. removed to Pararnix Spuler, on Clemens description of the venation. In regard to boreasella a word of explanation is required. Clemens described the species from a single specimen without a head and much mutilated, basing his determination upon the neuration, as he says, almost exclusively. Although he says it differs somewhat from the venation of species of Parornix sp. (Ornix Tr) then known to him, he was undoubtedly correct in his determination. I would direct particular attention to his description of the venation of the hindwings, which is as follows: "In the hindwings the venation is the same as in other members of the genus, except that the inosculation of the bifid subcostal vein with the tip of the costal, and of the lower branch of the former with the fureste discal nerrule, is almost obsolete and very indistinct." It will be noted that Clemens here has called attention to the three branches of the costa, shown in the species having the extra vein in the hindwing, mentioned at the beginning of this paper. Dietz² the last one to revise the North American species of Parornix Spl. (Ornix Tr) says that he believes it to be a true Ornix Tr.

Spuler's genus Eutrichocnemis³ was erected without a description of the neuration and he places under it the two species simploniella V. Rösl, and scalariella Zell, but does not specify the type. As Walsingham made scalariella Zell, the type of his genus Dialectica, I would propose, in order to simplify matters, to consider scalariella Zell, as the type species and list Eutrichocnemis as a synonym of Dialectica. The genus represented by these two names is placed provisionally under Acrocercops. One species, onosmodiella Busck, corresponds more closely to Dialectica in venation than it does to Acrocercops, differing from the former genus chiefly in that vein 2 of the forewing is absent.

It was believed that texanella Busek should be transferred from Parectopa Clemens, to Parornix Spuler, which it most resembles in venation. The venation is quite close to that of quitea Haw. but in some respects it is an interesting species quite different from any other listed under this genus. The species astericola Frey and Boll, quinquestrigella Cham, and rhombiferellum Frey and Boll, were transferred from Parectopa to Acrocercops on external characters, following Meyrick's scheme. The species salicifoliella Cham., was found to correspond closely with the

The Tineina of N. A., p. 237, 1872.
 Trans. Am. Ent. Soc., Vol. XXXIII, p. 290, 1907.

³ Spuler, Schmet. Eur. Band 2, p. 409, 1910.

type of Spuler's genus $Micrurapteryx^1$ and that genus is therefore included in this list.

Under Gracilaria the following changes have been made, fulgidella Clem. and Elotella Busek have been transferred to Marmara, on account of complete accord in venation as well as in other

respects.

The classification which is here presented is based principally upon the position of vein 11 in the forewings, the movement forward of the costal or the dorsal series of veins along the anterior portion of the cell, and the relationship of veins 7 and 8 in the hindwings. There is one character which has not been included in the present paper which may prove to be of value. Acrocercops has a weak longitudinal vein through the middle of the cell in the forewings which appears to have been wholly lost in Gracilaria. The same vein is shown very faintly and brok-

enly in some of the other genera.

There would appear to be three main branches within this family, represented by Gracilaria, Parornix and Acrocercops. these Gracilaria is generally accepted as approaching most nearly the primitive form. Some species of *Parornix*, however, in the shape of the wings and form of venation of the hind wings, are strongly suggestive of the Micropteryx type. Stainton indeed uses the name Ornichidae for the family (p. 10, Ins. Brit., 1854) though he afterwards abandons it in favor of Gracilariidae. Parcctopa appears to be an intermediate between Gracilaria and Paror-Micrurapteryx is from gracilariid stock and is related to Parectopa while Dialectica, Chilocampyla, Leucospilapteryx and Apophthisis are closely related to Acrocercops, Marmara preserves a portion of the base of 7 parallel to 8 which suggests a relationship to the Graeilariid branch probably nearest to Parectopa, Phyllonoryeter and its allies do not show a close relationship to any of the other genera and the parallel condition of 7 with 5, 6, is a great departure from the form of venation found in Gracilaria. It may be that this group is worthy of the family rank that is given it by some authors.

The difficulties in the way of interpreting a degraded neuration are illustrated in the case of *Leucanthiza*. There is nothing in the venation to show that it may not have been derived from *Gracilaria*, at the same time there is no positive evidence that it was so derived. The venation of the hindwings has been reduced to very nearly the simplest terms. There remain only the stems of the main branches, all separate. It would be difficult to see, for example, were venation the only guide, why the

¹ Spuler, Schmet. Eur. Band 2, p. 409, 1910.

Gracilaria (part)

genus *Phyllocnistis* included in a very different family might not be included with *Leucanthiza*. It is here that we are forced to fall back upon larval characters. *Leucanthiza* is therefore included in the Gracilariidae mainly on larval characters. The only suggestion of a family characteristic noted by the writer in this case, is the short vein 8 to the hump, in the hind wings.

The arrangement of genera which follows is constructed mainly upon venational characters, a few additional hints are however

given for those who may wish to use it as a key.

The writer wishes to express his thanks to Mr. Heinrich for comparing the genitalia of a number of species whose status was in doubt. To Mr. Busck he wishes to gratefully acknowledge his indebtedness for help and advice upon numerous occasions. It is through the latter that there were available a number of named species which had been compared with Chambers' types, as well as notes regarding them.

KEY TO GENERA.

1.	Hindwings with branch to costa between terminations on costa of 7 and 8
	Hindwings without branch to costa between terminations on costa of 7 and 8
2.	Forewings, 11 from near base of cell (head smooth (Gracilaria (part)
	Forewings, 11 from about \(\frac{1}{3} \) of eell (head rough)
3.	Hindwings, 8 veins (4 weak in Micrurapteryx) 4
	Hindwings, less than 8 veins
4.	Forewings, 11 from near base of cell (hind tibiae smooth)
	Forewings, 11 from $\frac{1}{3}$ of cell or beyond $\frac{1}{3}$ (hind tibiae with bristles
	above)6
5.	Forewings, 6 and 7 separate
	Forewings, 6 and 7 stalked
6.	Forewings, 12 veins (11 veins in onosmodiella)
	Forewings, less than 12 veins 8
7.	Forewings, 6 separate (base of antennae with eye flap) Chilosampula
	Forewings, 6 stalked, with 5 or with 7
8.	Forewings, 7 stalked with 8, or absent Leucospilapteryx
	Forewings, 7 stalked with 6
9.	Hindwings, 7 veins (5 and 6 stalked)
	Hindwings, less than 7 veins
10.	Forewings, 11 very near base of cell (10 not toward end of cell) 11
	Forewings, 11 from about \(^1_3\) of cell (10 toward end of cell). \(Parectopa\)
11.	Forewings, 12 yeins, 2 and 3 weak (hind tibiae bristles above)
	Neurobathra
	Forewings, 11 veins, one dorsal branch absent (hind tibiae smooth)

12. Hindwings, 6 veins, 5 and 6 stalked
Hindwings, 5 veins, 6 absent
13. Forewings, 12 veins, separate, 11 near base (hind tibiae bristles above)
Neurostrota
Forewings, 11 absent (hind tibiae without bristles)
14. Forewings, 9 veins
Forewings, less than 9 veins
15. Forewings, 8 veins (head rough)
Forewings, 7 veins (head smooth)
16. Forewings, 9 veins (head smooth)
Forewings, 7 veins (head rough)
Forewings, 6 veins (head rough)

Porphyrosela Braun.

Type: Porphyrosela desmodella Clem.

Characters as in *Phyllonorycter* Hb. except that vein 10 is obsolescent or absent, the hind tibiae without hairs and the basal joint of the antennae without a pecten.

Cameraria Chapman.

Type: Phyllonoryeter rajella Linn.

Characters as *Phyllonorycter* except that the larva is flat and the nerve always on the upper side of the leaf of the food plant.

Phyllonorycter Hübner.

Type: Cameraria guttifinitella Clem.

Head roughly tufted on crown, face smooth. Antennae about 1, basal joint rather thick, usually with slight pecten. Labial palpi moderate or short, porrected or drooping, filiform, pointed. Maxillary palpi minute, filiform, porrected or rudimentary. Posterior tibiae with loosely appressed hairs. Forewings lanceolate; 7 veins, 3 absent, 4 absent, 6 absent, 8 absent, 11 absent. Hindwings about ½, linear, lanceolate, cilia 4-5; 3 absent, 4 absent, 6 absent.

Larva cylindrical.

Cremastobombycia Braun.

Type: Cremastobombyeia solidaginis Frey and Boll.

Characters as in *Phyllonorycter* Hb. except that vein 6 is present, stalked with 5, in both forewing and hindwing.

Marmara Clemens.

Type: Marmara solictella Clem.

Head smooth. Antennae $\frac{4}{5}$ to 1, basal joint thick with slight pecten. Labial palpi moderate, porrected, slender, pointed. Maxillary palpi

moderate, porrected, loosely scaled toward tip. Posterior tibiae smooth scaled. Forewings lanceolate; 3 absent, 4 absent, 6 absent, 8 absent, 11 absent. Hindwings about ½, linear lanceolate, 3 absent, 4 absent, 5 and 6 stalked.

The venation of the forewings is very similar to that of *Phyllo-norycter* Hb., but differs from the latter in that 7 approximates 8 toward the base and is well separated from the stalk of veins 5 and 6 in the hindwings.

Leucanthiza Clemens.

Type: Leucanthiza amphicarpeae foliella Clem.

Head loosely rough haired on crown, face smooth. Antennae 1, basal joint hardly thickened. Labial palpi short, slender, drooping. Maxillary palpi rudimentary. Posterior tibiae with appressed seales. Forewings lanceolate; 3 absent, 4 absent, 11 absent. Hindwings about ½, narrow lanceolate, cilia 4; 3 absent, 4 absent, 6 absent.

It should be noted that vein 6 is not stalked with 5 as stated by Meyrick but is absent.

Neurolipa nov. gen.

Type: Neurolipa randiella Busck.

Head smooth. Antennae 1, base enlarged with faint pecten. Labial palpi loosely scaled, porrected or drooping, end joint equal to second, curved. Maxillary palpi moderate, filiform, loosely scaled, porrected. Hind tibiae with long appressed hairs. Forewings elongate, acuminate; 9 veins, 11 absent, one costal and one dorsal branch absent from near outer end of cell. Hindwings linear; 6 veins, 2, 3 and 4 coincident, 5 and 6 stalked.

This genus has a venation apparently derived from the Acrocercops type but the hind tibiae are similar to Phyllonorycter Hb.

Apophthisis Braun.

Type: Apophthisis pullata Braun.

Head with appressed seales. Antennae somewhat under 1, basal segment with pecten. Labial palpi moderate, straight, drooping. Maxillary palpi rudimentary. Posterior tibiae with a row of short projecting scales above. Forewings lanceolate, the margin from the inner angle to the apex is almost straight or slightly concave; 2 almost obsolete, 3 absent, 4 indistinct, from lower angle of the cell, 5 absent, 6 and 7 stalked, transverse vein indistinct between 4 and 6, 11 obsolete except at origin and near costa. Hindwings about ½ lanceolate, cilia 5; 5 and 6 stalked.

This genus is known to me only from the original description given above and the figure of the venation which accompanies

the description. It appears to be a derivative of the A crocercops group.

Leucospilapteryx Spuler.

Type: Leucospilapteryx mussella Stainton.

Head smooth. Antennae 1, base somewhat enlarged. Labial palpi moderate; somewhat roughly haired, porrected, end joint equal second, recurved. Maxillary palpi filiform, small, porrected. Hind tibiae with row of bristly hairs above. Forewings elongate lanceolate; 11 more than $\frac{1}{3}$ of cell from the base and strongly joined to cell, 7 stalked with 8, or absent, one dorsal branch from cell absent (possibly 3), 4 and 5 shortstalked. Hindwings nearly linear, acuminate; 8 veins, 5 and 6 stalked and joined to 7 by a cross vein near middle of wing.

A genus derived from the Acrocercops group.

Acrocercops Wallengren.

Type: Acrocercops brogniardellum Fabr.

Head smooth. Antennae more than 1, labial palpi long, curved, ascending, tufted beneath on second joint, terminal joint equal to second, pointed. Maxillary palpi filiform, porrected. Posterior tibiae with row of bristly hairs above. Forewings elongate and acuminate; 12 veins, 2 weak toward its base, 5 and 6 stalked; (In Dialectica, Wlsn, 6 is stalked with 7), origin of 11 distant from base of cell. Hindwings about one-half, narrow lanceolate; 8 veins, 5 and 6 stalked and connected to 7 by cross vein.

The above description is given from a European specimen of the type species, and is very much more restricted than that given by Meyrick in the Gens. Ins.

Chilocampyla Busek.

Type: Chilocampyla dyariella Busek.

Head smooth. Antennae nearly $1\frac{1}{2}$, basal joint somewhat flattened and enlarged with a projecting flap of dense scales. Labial palpi long, smooth, curved, subascending, pointed. Maxillary palpi filiform, moderate, porrected. Middle tibiae thickened with heavy tuft of scales. Posterior tibiae with double row of bristles above. Forewings elongate lanceolate; 12 veins, 2 weak, 6 and 7 stalked, 11 from toward middle of cell margin (10 in 3 obliterated by a costal depression). Hindwings $\frac{1}{2}$, linear; 8 veins, 5 and 6 stalked.

A genus related to Acrocercops Wallgr, both by venation and hind tibiae. Separated from this genus by its flap of scales at the base of the antennae and thickened middle tibiae.

Neurostrata nov. gen.

Type: Neurostrota gunniella Busck.

Head smooth. Antennae 1, basal joint slightly enlarged. Labial palpi moderately long, porrected, smooth, end joint equal to second, pointed, upcurved. Maxillary palpi moderate, filiform, porrected. Posterior tibiae with row of bristly hairs above. Forewings lanceolate; 12 veins, all well separated, 2 weak at base, 11 from near base, not joined to cell. Hindwings linear lanceolate, acuminate; 6 veins, 4 absent, 2 and 3 coincident (in some specimens a portion of 2 is faintly discernible), 5 and 6 stalked and connected with 7, base of 7 parallel to 8, in the 3 a spiny process at the termination of 8 on the costa.

A genus related to the *Acrocercops* group but with broader wings, complete venation and basal origin of 11, in the forewings, and degraded neuration in the hindwings.

Neurobathra nov. gen.

Type: Neurobathra strigifinitella Clemens.

Head smooth. Antennae I, basal joint somewhat enlarged, very faint pecten of few hairs. Labial pulpi moderately long, porrected, end joint equal in length to second, pointed up curved. Maxillary palpi moderate, filiform, porrected. Posterior tibiae with row of bristly hairs above. Forewings narrowly lanceolate; 12 veins, 11 from very near the base of cell, 2 and 3 very weak, 3 out of the base of 4, 4 and 5 widely separated. Hindwings linear-lanceolate; 7 veins, 4 absent. 5 and 6 stalked, 7 close to 8 near origin, approaching or connected with stalk of 5 and 6 near middle of wing, costal fold in ♂ producing deformed neuration.

This genus may be separated from others in the Acrocercops group by the basal origin of vein 11 and the weakened condition of both 2 and 3 in the forewing and the absence of vein 4 in the hindwing. The venation resembles Microraptery's Spuler from which genus it may be separated by the characters of the hind tibiae.

Parectopa Clemens.

Type: Parectopa les pedezae foliella Clem.

Head with appressed scales. Antennae 1, with slight peeten. Labial palpi moderately long, curved upward, terminal joint equal second in length, smooth or slightly roughened. Maxillary palpi moderate, filiform, porrected. Middle and hind tibiae smooth scaled. Forewings elongate, acuminate; 11 veins (or sometimes 10), 2 or 3 absent (or sometimes both 2, and 3), 6 and 7 often stalked. 11 from about $\frac{1}{3}$ of cell from base. Hind wings about $\frac{1}{2}$, linear lanceolate; 7 veins, 5 and 6 stalked, 4 absent.

The above description is based mainly on a study of P. robiniella Clem. bred specimens of P. lespedezaefoliella not being available. Clemens in his original description gives 8 as arising out of 7 near its base.

The genus as given above is more narrowly restricted than as given by Meyrick, whose definition would include *Micrurapyteryx* Spuler, given below.

Micrurapteryx Spuler.

Type: Micrurapteryx Kollariella Zeller.

Head smooth, erectile tufts of seales at either side of crown. Antennae 1, basal joint moderately enlarged. Labial palpi smooth, porrected or drooping. Maxillary palpi filiform, small. Hind tibiae smooth. Forewings elongate lanceolate, acuminate; 12 veins, 11 from near base, 6 and 7 stalked, 2 and 3 stalked and weak. Hind wings ½ nearly linear, 8 veins, 4 very weak, 5 and 6 stalked.

This genus is probably an older form from which *Parectopa* Clemens, may have been derived. It is apparently more nearly related to *Gracilaria* than is the case with *Parectopa*.

Parornix Spuler.

Type: Parornix anglicella Stainton.

Head rough haired, face smooth. Antennae about 1, basal joint moderate. Labial palpi moderately long, slightly curved, porrected or subascending, smooth scaled, terminal joint shorter than second, pointed. Maxillary palpi moderately long, filiform, porrected. Posterior tibiae smooth scaled. Forewings lanceolate or elongate lanceolate; 11 veins, one dorsal vein absent (2 or 3, possibly), 6 and 7 stalked, 11 from about \(\frac{1}{3}\) of cell from base. Hindwings, \(\frac{2}{3}\), narrow lanceolate; 4 usually absent, a branch to costa from cell between 7 and 8.

This genus corresponds to *Ornix* as given by recent authors. The latter name must unfortunately be ruled out of existence. For a recapitulation of the reasons for the change of name see Walsingham, Biol. Centr. Amer. IV, p. 341, 1909–1915. This genus may be separated from *Gracilaria* by means of its rough head.

It may be that the group of species related to guttea Haw. may have to be removed from this genus. Spuler places them under Ornix Tr., and separates them from his genus Parornix. If, however, the name Ornix is to fall it will necessitate the substitution of a new name for Ornix Tr., to include the species related to guttea Haw. having a complete venation in the hindwing.

Gracilaria Haworth.

Type: Gracilaria syringella Fabricius.

Head smooth. Antennae 1 or over 1, basal joint more or less elongate. Labial palpi long, curved, ascending, second joint sometimes with tuft beneath, terminal joint about as long as second, pointed. Maxillary palpi moderate, filiform, porrected. Middle tibiae tufted with dense scales, posterior tibiae smooth. Forewings elongate lanceolate or narrowly elongate; normally 12 veins (one dorsal branch from cell sometimes absent), 4 and 5 sometimes stalked. Hind wings about ½, narrowly elongate, acuminate; 8 veins usually (sometimes anabsolescent additional vein is distinguishable arising from the stemof 7 beneath the termination of 8 on the costa), 5 and 6 stalked.

This is a large genus which will probably eventually be broken up. Among our North American species we have none which comes close to syringella, the type, nor indeed to the species proposed as types of Euspilapteryx Steph., Aspilapteryx Spuler and Xanthospilapteryx Spuler. Practically all our species, hitherto described, will be found under Meyrick's division E of the genus Gracilaria and form quite a compact group, easily separable from other members of the family. In most of our species the venation is complete and but little tendency of the veins to stalk with one another is shown.

Explanation of Plates.

PLATE VI.

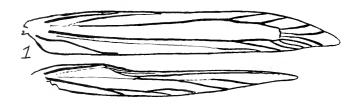
- Fig. 1. Gracilaria elongella Linn. (European).
- Fig. 2. Graeilaria murtfeldtella Busck (Hindwing).
- Fig. 3. Gracilaria syringella Fabr. (European).
- Fig. 4. Parornix guttea Haw. (European).

PLATE VII.

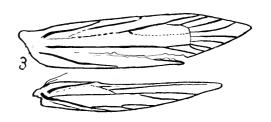
- Fig. 1. Cremastobombycia solidaginis Frey and Boll.
- Fig. 2. Neurolipa randiella Busek.
- Fig. 3. Parornix preciosella Dietz.
- Fig. 4. Leucanthiza amphicarpeaefoliella Clemens (after Clemens).
- Fig. 5. Marmara fasciella Chambers.
- Fig. 5. Acrocercops onosmodiella Busek (Forewing).

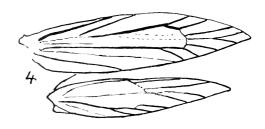
PLATE VIII.

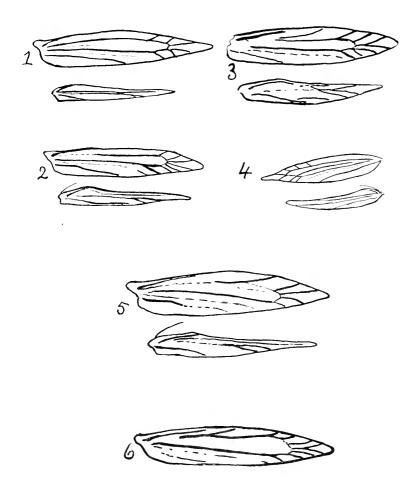
- Fig. 1. Acroeercops brogniardellum Fab. (European).
- Fig. 2. Acroeercops (Dialectica) scalariella Zell (European).
- Fig. 3. Leucospilanterux venustella Clemens.
- Fig. 4. Parectopa pennsylvaniella Engel.
- Fig. 5. Apophthisis pullata Braun (after Braun).
- Fig. 6. Micrarapteryx salicifoliella Chambers.

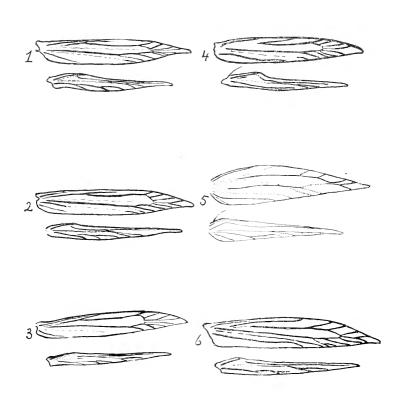


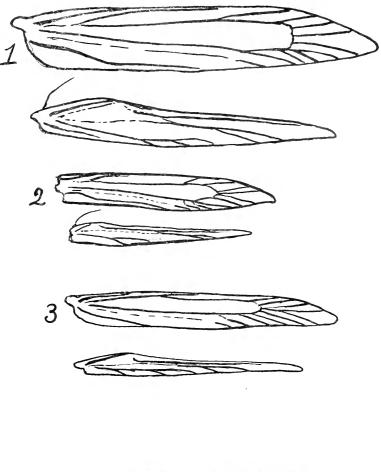












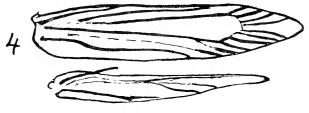


PLATE IX.

- Fig. 1. Gracilaria stigmatella Fabr. (Form purpuriella, Chambers).
- Fig. 2. Neurobathra strigifinitella Clemens.
- Fig. 3. Chilocampyla dyariella Busck.
- Fig. 4. Neurostrota gunniella Busck.

The following list has for the most part been compiled from the lists of Dyar and Meyrick and the card catalogue of species in the U. S. Nat. Museum collections.¹

With the exception of a few additions of recently described species, or corrections already noted, no revision has been made as to the identification or arrangement of species listed in Braun's Rev. of N. Am. *Lithocolletis* or in the Rev. of *Ornix* by Dietz. In regard to the relationship and arrangement of genera related to *Phyllonorycter Hib.* (*Lithocolletis*) one is referred to the works of Braun and Chapman and to Busck, Proc. Ent. Soc. Wash., XI, p. 100, 1909 and also to a letter from Meyrick, Proc. Ent. Soc. Wash., XI, p. 187, 1909.

For a more extended list of references to the synonymy of genera under *Gracilaria*, *Acrocercops*, *Parornix* (Ornix) and *Phyllonorycter* (Lithocolletis) one should consult Walsingham, Biol. Centr. Amer., 1915.

In all other genera than those included in the papers of Braun and Dietz, referred to above, the material in the U. S. Nat. Mus. has been examined with care, and all species which are not represented in the U. S. Nat. Mus. collections are marked with an asterisk (*) and their places in the list are based on published descriptions only. Species represented in the collections but which could not be satisfactorily examined as to venation, and which should be further studied in this respect, are marked with the symbol (†).

Names of species are given as originally printed and new names or revisions in spelling are not accepted, save only where a typographical error has been corrected.

As a result of data obtained by Mr. Carl Heinrich upon the comparison of the male genitalia of certain European and American species, closely resembling one another, it was found that clongella L. and alnivorella Cham. are distinct species, and the former is dropped from the list. In the case of stigmatella Fabr. and purpuriella Cham., however, there appeared to be no difference and the latter is therefore made a synonym of stigmatella.

¹ Since this list was prepared the Check List of the Lepidoptera of Boreal America, Barnes and McDonnough, Decatur, Ill., Feb. 1917, has appeared. The latter, so far as the Gracilariidae are concerned, closely follows Meyrick's lists.

In regard to cuculipennellum Hüb, and fraxinella Ely the difference was so slight as to be questionable. The latter is therefore listed as a doubtful synonym of the former. The other European species, falconipennella Hüb, and alc imiella Scop., have been dropped from the list of American species, as is done by Meyrick.

It was thought best not to disturb the existing synonymy under alnivorella Chambers. It is quite likely that several good species may be included under this name but it does not seem advisable to attempt to separate them, in the absence of sufficient bred material. It may be pointed out here that Chambers claimed that alnivorella and alnivolella differed in their food habits.

A LIST OF THE GRACHARHDAE OF NORTH AMERICA.

(Dyar Cat = Dyar, Bull. 52, U. S. Nat. Mus. Wash., 1902.) Meyr. Cat = Meyrick, Lep. Cat., pars. 6, 1912.)

Family GRACILARIIDAE.

PORPHYROSELA Braun,

Rev. Am. Lith., p. 348, pl. XX, fig. 8, 1908.

Type: desmodiella Clemens.

desmodiella Clemens, Proc. Acad. Nat. Sci. Phil., p. 220, 1859; Tin. No. Am., pp. 65, 68, 1872; Chambers, Can. Ent., JHI, pp. 127, 162, 1871;
Jn. Cin. Soc. Nat. Hist., II, p. 189, 1879; Frey & Boll, Stett. ent. Zeit., XXXVII, p. 227, 1876; Wlsm., Trans. Am. Ent. Soc., X, p. 202, 1882; Busek, Proc. Ent. Soc. Wash., V, p. 187, 1903; Dyar, Cat., No. 6303; Braun, Am. Lith., p. 348, pl. XXIV, figs. 14, 15, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 110—, fig. 9, 1914.

syn: gregariella Murtf., Can. Ent., 13, p. 245, 1881; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41.

Foodplants: Desmodium, Lespedeza, Phaseolus; under mine. East U. S.

CAMERARIA Chapman.

The Entomologist, vol. XXXV, p. 141, 1902.

Type: guttifinitella Clemens.

gaultheriella Wlsm., Ins. Life., II, p. 79, 1889; Dyar, Cat., No. 6291;
Braun, Rev. Am. Lith., p. 324, pl. XXIII, fig. 6, 1908; Meyr., Gen.
Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci.
Phil., XVI, pp. 117—, fig. 91, 1914.

Foodplant: Gaultheria shallon; upper mine. West. U. S., Brit. Colnemoris Wlsm., Ins. Life., 11, p. 116, 1899; Dyar, Cat., No. 6293; Braun, Rev. Am. Lith., p. 324; pl. XXIII, fig. 7, 1908; Meyr., Gen. Ins.,

128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 90, 1914.

Foodplant: Vaccinium ovata; upper mine.

Calif.

caryaefoliella Clemens, Proc. Acad. Nat. Sci. Phil., p. 323, 1859; Tin. No. Am., pp. 65, 74, 1872; Chambers, Can. Ent., III, pp. 109, 165, 1871; Frey & Boll, Stett. ent. Zeit., XXXIX, p. 273, 1878; Busek, Proc. Ent. Soc. Wash., V, p. 189, 1903; Dyar, Cat., No. 6288; Braun, Rev. Am. Lith., p. 325, pl. XXIII, fig. 8, 1908; Meyr., Gen. Ins. 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 72, 1914.

syn: juglandiella Clemens, Proc. Ent. Soc. Phil., I, p. 81, 1861; Tin.
No. Am., p. 170, 1872; Chambers, Can. Ent., III, p. 165, 1871; NI,
p. 91, 1879; Packard, Guide Stud. Ins., p. 353, 1869; Braun, Rev.
Am. Lith., p. 325, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr.,
Cat., p. 39.

syn: caryifoliella Meyr., Meyr., Cat., p. 39.

Foodplant: Hicoria Juglans; upper mine. East. U. S.

lentella Braun, Rev. Am. Lith., p. 326, pl. XXIII, fig. 9, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 73, 1914.

Foodplants: Betula lenta; Ostrya virginiana; upper mine. East. U. S. saccharella Braun, Ent. News., XIX, p. 104, 1908; Braun, Rev. Am. Lith., p. 327, pl. XXIII, fig. 10, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 76, 1914.

Foodplant: Acer.; upper mine.

N. J., Ohio.

macrocarpella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 261, 1878;
Wlsm., Ins. Life., II, p. 78, 1889; Dyar, Cat., No. 6289; Braun,
Rev. Am. Lith., p. 328, pl. XXIII, fig. 11, 1912; Meyr., Gen. Ins.,
128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil.,
XVI, pp. 117—, fig. 74, 1914.

Foodplant: Quercus macrocarpa; upper mine. Tex. N. J.

cincinnatiella Chambers, Can. Ent., III, pp. 146, 149, 1871; Cin. Quart.
Jn. Sei., I, p. 203, 1874; Bull. Geol. Surv. Terr., III, p. 141, 1877;
Wlsm., Ins. Life, II, p. 78, 1889; Lyar, Cat., No. 6287; Braun, Rev.
Am. Lith., p. 329, pl. XXIII, fig. 12, 1912; Meyr., Gen. Ins., 128,
p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI,
pp. 117—, fig. 75, 1914.

Foodplant: Quereus alba; upper mine. East. U. S.

hamadryadella Clemens, Proc. Acad. Nat. Sci. Phil., p. 324, 1859; Tin. No. Am., 65, 77, 1872; Chambers, Can. Ent., III, pp. 55, 164, 182, 1871; Cin. Quart. Jn. Sci., I. p. 201, 1875; II, p. 104, 1875; Frey & Boll., Stett. ent. Zeit. XXXIX, p. 262, 1878; Busek.. Proc. Ent. Soc. Wash., V, p. 190, 1903; Dyar, Cat., No. 6334; Braun, Rev. Am. Lith., p. 329, pl. XXIII, fig. 13, 1912; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., ,XVI pp. 117--, fg. 77, 1914.

syn: alternatella Zeller, Verh. zool-bot. Ges. Wien., XXV, p. 351, 1875; Braun, Rev. Am. Lith., p. 329, 1912; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39.

syn: alternata Chambers, Bull. Geol. Surv. Terr., IV, p. 153, 1878; Braun, Rev. Am. Lith., p. 329, 1912.

Foodplants: Quercus alba; Magnolia; Ostrya virginiana; upper mine.

East U. S.

umbellulariae Wlsm., Ins. Life., II, p. 78, 1889; Dyar, Cat., No. 6290;
Braun, Rev. Am. Lith., p. 330, pl. XXIII, fig. 14, 1908; Meyr.,
Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat.
Sei. Phil., XVI, pp. 117—, fig. 78, 1914.

Foodplant: Umbellularia californica; upper mine. Calif.

agrifoliella Braun, Ent. News., XIX, p. 105, 1908; Braun, Rev. Am.
Lith., p. 331, pl. XXIII, fig. 15, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 79, 1914.

Foodplant: Quercus agrifolia; upper mine. Calif.

conglomerateHa Zeller, Verh. zool-bot. Ges. Wien., XXV, p. 346, 1875;
Wlsm., Ins. Life., II, p. 24, 1889; Dyar, Cat., No. 6295; Braun,
Rev. Am. Lith., p. 332, pl. XXIII, fig. 16, 1908; Meyr., Gen. Ins.,
128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil.,
XVI, pp. 117—, fig. 94, 1914.

syn: bicolorella Chambers, Bull. Geol. Surv. Terr., IV, p. 103, 1878; Braun, Rev. Am. Lith., p. 332, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39.

syn: obtusilobae Frey & Boll, Stett. ent. Zeit., XXXIX, p. 265, 1878; Braun, Rev. Am. Lith., p. 332, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39.

Foodplant: Quercus virginiana; upper mine. U. S.

ulmella Chambers, Can. Ent., III, p. 148, 1871; Cin. Quart. Jn. Sci., I, p. 202, 1874; II, p. 101, 1875; Frey & Boll, Stett. ent. Zeit., XXXIV, p. 214, 1873; Wlsm., Ins. Life., II, p. 24, 1889; Dyar, Cat., No. 6294; Braun, Rev. Am. Lith., p. 333, pl. XXIII, fig. 17, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 95, 1914.

syn: modesta Frey & Boll, Stett. ent. Zeit., XXXVII, p. 224, 1876;
 XXXIX, p. 274, 1878; Braun, Rev. Am. Lith., p. 333, 1908; Meyr.,
 Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39.

Foodplant: *Ulmus*; upper mine. **quercivorella** Chambers, Can. Ent., XI, p. 145, 1879; Wlsm., Ins. Life., II, p. 24, 1889; Dyar, Cat., No. 6296; Braun, Rev. Am. Lith., p. 334, pl. XXIII, fig. 18, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 93, 1914.

Foodplant: Quercus; upper mine. East U. S.

mediodorsella Braun, Rev. Am. Lith., p. 335, pl. XXIII, fig. 19, 1908;
 Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 92, 1914.

Foodplant: Quereus; upper mine.

Calif.

australisella Chambers, Bull. Geol. Surv. Terr.. IV. p. 103, 1878; Dyar.
Cat., No. 6297; Braun, Rev. Am. Lith., p. 335; pl. XXIII, fig. 20,
1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 39; Braun,
Jn. Ac. Nat. Sci. Phil., pp. 117—, fig. 83, 1914.

syn: australella Meyr., Meyr., Cat., p. 39.

Tex.

chamberseHa Wlsm., Ins. Life., II, p. 78, 1889; Dyar, Cat., No. 6300;
Braun, Rev. Am. Lith., p. 336, pl. XXIII, fig. 21, 1908; Meyr.,
Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 85, 1914.

syn: quinquenotella Chambers, Jn. Cin. Soc. Nat. Hist., II, 189, 1800;
 Braun, Rev. Am. Lith., p. 336, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40.
 Tex.

cervina Wlsm., Proc. U. S. Nat. Mus. XXXIII, p. 221, 1907; Braun, Rev. Am. Lith., p. 336, pl. XXIII, fig. 22, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 86, 1914.

N. Y.

platanoidiella Braun, Ent. News., XIX, p. 106, 1908; Braun, Rev. Am.
Lith., p. 337, pl. XXIII, fig. 23, 1908; Meyr., Gen. Ins., 128, p. 10.
1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 87, 1914.

Foodplant: Quercus; upper mine.

Ohio, N. Y.

fletcherella Braun, Rev. Am. Lith., p. 338, pl. XXIII, fig. 24, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 80, 1914.

Foodplant: Quereus; upper mine.

Can.

arcuella Braun, Ent. News., XIX, p. 107, 1908; Rev. Am. Lith., p. 338,
pl. XXIV, fig. 1, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr.,
Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 81,
1914.

betulivora Wlsm., Ins. Life., III, p. 326, 1891; Dyar, Cat., No. 6328;
Braun, Rev. Am. Lith., p. 339; pl. XXIV, fig. 2, 1908; Meyr., Gen.
Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci.
Phil., XVI, pp. 117—, fig. 82, 1914.

Foodplant: Betula.

Locality?

eppelsheimii Frey & Boll, Stett, ent. Zeit., XXXIX, p. 272, 1878; Dyar, Cat., No. 6325; Braun, Rev. Am. Lith., p. 339, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40.

Foodplant: Carya; upper mine.

Tex.

bethunella Chambers, Can. Ent., III, p. 109, 1871; Cin. Quart. Jn. Sci.,
11, p. 103, 1875; Can. Ent., XI, p. 89, 1879; Dyar. Cat., No. 6326;
Braun, Rev. Am. Lith., p. 340, pl. XXIV, fig. 3, 1908; Meyr., Gen.

Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 84, 1914.

syn: lebertella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 266, 1878;Dyar, Cat., No. 6327; Braun, Rev. Am. Lith., p. 340, 1908; Meyr.,Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40.

Foodplant: Quereus; upper mine.

U.S.

picturatella Braun, Ent. News., XXVII, p. 84, 1916.

Foodplant: Myrica carolinensis; upper mine. Gonn., N. Y., N. J. fasciella Wlsm., Ins. Life., 111, p. 326, 1891; Eyar, Cat., No. 6317; Braun, Rev. Am. Lith., p. 341, pl. XXIV, fig. 4, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 89, 1914.

syn: unifasciella Chambers (not Tengström), Cin. Quart. Jn. Sci., II, p. 103, 1875; Braun, Rev. Am. Lith., p. 341, 1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40.

Foodplant: Quercus; upper mine.

Ohio and Ky.

castaneaeeHa Chambers, Cin. Quart. Jn. Sei., II, p. 104, 1875; Dyar,
Cat., No. 6318; Braun, Rev. Am. Lith., p. 341, pl. XXIV, fig. 5,
1908; Meyr., Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 40; Braun,
Jn. Ac. Nat. Sei. Phil., XVI, pp. 117—, fig. 88, 1914.

syn: castanella Włsm., Ins. Life., 111, p. 329, 1891; Braun, Rev. Am. Lith., p. 341, 1908.

syn: castaneella Meyr., Cat., p. 40.

Foodplants: Quercus and Castanea; upper mine.

guttifiniteHa Clemens, Proc. Acad. Nat. Sci. Phil., p. 324, 1859; Tin. No. Am., pp. 65, 76, 1872; Chambers, Can. Ent., HI, p. 110, 1871; Cin. Quart. Jn. Sci., I, p. 201, 1874; Bull. Geol. Surv. Terr., IV, p. 102, 1878; Jn. Cin. Soc. Nat. Hist., II, p. 82, 1879; Busek, Proc. Ent. Soc. Wash., V, p. 189, 1903; Dyar, Cat., No. 6306; Braun, Rev. Am. Lith., p. 342; pl. XXIV, fig. 6, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 71, 1914.

syn: toxicodendri Frey & Boll, Stett. ent. Zeit., XXXIX, p. 273.
1878; Dyar, Cat., No. 6304; Braun, Rev. Am. Lith., p. 342, 1908;
Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40.

Foodplant: Rhus toxicodendron. East. U. S.

obstrictella Clemens, Proc. Acad. Nat. Sci. Phil., p. 322, 1859; Tin. No. Am., pp. 64, 73, 1872; Chambers, Can. Ent., 111, p. 183, 1871; Bull. Geol. Surv. Terr., IV, p. 102, 1878; Dyar, Cat., No. 6307; Braun, Rev. Am. Lith., p. 342, pl. XXIV, fig. 7, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 64, 1914.

syn: bifasciella Chambers, Bull. Geol. Surv. Terr., IV, p. 101, 119,
153, 1878; Dyar, Cat., No. 6329; Braun, Rev. Am. Lith., p. 342,
1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40.

syn: ceriferae Włsm., Proc. U. S. Nat. Mus., XXXIII, p. 222, 1907:

Braun, Rev. Am. Lith., p. 342, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40.

Foodplant: Quercus; upper mine. N. Y., Pa., Ohio, Ky.

corylisella Chambers, Can. Ent., III, p. 111, 127, 1871; Lyar, Cat., No. 6308; Braun, Rev. Am. Lith., p. 344, pl. XXIV, fig. 8, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 69, 1914.

syn: coryliella Chambers, Can. Ent., XI, p. 90, 1879; Braun, Rev. Am. Lith., p. 344, 1908.

syn: bifasciella Wlsm., Proc. U. S. Nat. Mus., XXXIII, p. 223, 1907; Braun, Rev. Am. Lith., p. 344, 1908; Meyr., Gen. Ins., 128, p. 11, 1912.

syn: corylella Meyr., Meyr., Cat., p. 40.

Foodplant: Corylus americana; upper mine. East. U. S.

aesculisella Chambers, Can. Ent., III, p. 111, 1871; Wlsm., Ins. Life.,
II, p. 53, 1889; Busck, Proc. Ent. Soc. Wash., V, p. 190, 1903; Braun,
Rev. Am. Lith., p. 344, pl. XXIV, fig. 9, 1908; Meyr., Gen. Ins.,
128, p. 11, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil.,
XVI, pp. 117—, fig. 70, 1914.

syn: aesculella Riley, Smith's List Lep. Bor. Am., p. 109, 1891; Braun, Rev. Am. Lith., p. 344, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40.

Foodplant: Aesculus; upper mine Central U. S.

ostryarella Chambers, Can. Ent., III, p. 111, 1871; Tin. No. Am., p. 72, 1872; Dyar, Cat., No. 6335; Braun, Rev. Am. Lith., p. 345, pl. XXIV, fig. 10, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 40; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 68, 1914.

syn: ostryella Meyr., Meyr., Cat., p. 40.

Foodplants: Ostrya virginiana and carpinus caroliniana. East. U. S.
aceriella Clemens, Proc. Acad. Nat. Sci. Phil., p. 325, 1859; Tin. No. Am., pp. 65, 75, 1872; Busek, Proc. Ent. Soc. Wash., V, p. 189, 1903; Dyar, Cat., No. 6305; Braun, Rev. Am. Lith., p. 346, pl. XXIV, fig. 11, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 66, 1914.

Foodplant: Acer; upper mine. Atl. States, Can.

hamameliella Busek, Proc. Ent. Soc. Wash., V, p. 189, 1903; Braun,
Rev. Am. Lith., p. 347, pl. XXIV, fig. 12, 1908; Meyr., Gen. Ins.,
128, p. 11, 1912; Meyr., Cat., p. 41; Braun, Jn. Ac. Nat. Sci. Phil.,
XVI, pp. 117—, fig. 67, 1914.

syn: hamamelis Riley, Smith's List Lep. Bor. Am., 1903, No. 6844; Braun, Rev. Am. Lith., p. 347, 1908.

Foodplant: *Hamamelis virginiana*; upper mine. Atl. States. tubifereIIa Clemens, Proc. Acad. Nat. Sci. Phil., p. 208, 1860; Tin. No. Am., p. 140, 1872; Chambers, Can. Ent., III, p. 165, 183, 1871; Wlsm. Ins. Life., II, p. 24, 77, 1889; III, p. 329, 1891; Busck, Proc. Ent. Soc.

Wash, V. p. 204, 1903; Dyar, Cat., No. 6330; Braun, Rev. Am. Lith., p. 347, pl. XXIV, fig. 13, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 117—, fig. 65, 1914.

Foodplant: Quercus; upper mine. Atl. States.

PHYLLONORYCTER Hübner.

Tentamen 1806.

Type: rayella Linn.

- fitchella Clemens, Proc. Acad. Nat. Sci. Phil., p. 207, 1860; Tin. No. Am., p. 139, 1872; Chambers, Can. Ent., III, p. 183, 1871; Cin. Quart. Jn. Sci., 1, p. 201, 1874; Packard, Guide Stud. Ins., p. 353, 1869; Chambers, Bull. Geol. Surv. Terr., III, p. 139, 1877; Can. Ent., XI, p. 90, 1879; Frey & Boll, Stett. ent. Zeit., XXXIX, p. 260, 1878; Busck, Proc. Ent. Soc. Wash., V, p. 204, 1903; Eyar, Cat., No. 6253; Braun, Rev. Am. Lith., p. 277, pl. XXI, fig. 1, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 26; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 115—, fig. 14, 1914.
 - syn: quercifoliella Fitch, Fifth Rept. Ins. N. Y., p. 327, 1859; Braun, Rev. Am. Lith., p. 277, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27.
 - syn: quercitorum Frey & Boll, Stett. ent. Zeit., XXXIV, p. 207,
 1873; Zeller, Verh. zool-bot. Ges. Wien., XXV, p. 346, 1875; Chambers, Cin. Quart. Jn. Sei., I, p. 201, 1874; H, p. 229, 1875; Bull. Geol. Surv. Terr., 111, pp. 139, 141, 1877; Braun, Rev. Am. Lith., p. 277,
 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27.
 - Foodplant: Quercus; under mine. East U. S.
- Ieucothorax Wlsm., Proc. U. S. Nat. Mus., XXXIII, p. 223, 1907; Braun, Rev. Am. Lith., p. 278, pl. XXI, fig. 2, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Ent. News, XXVII, p. 83, 1916; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 115—, fig. 13, 1914.
- bataviella Braun, Rev. Am. Lith., p. 278, pl. XXI, fig. 3, 1908; Meyr.,
 Gen. Ins., 128, p. 10, 1912; Meyr., Cat., p. 38; Braun, Jn. Ac. Nat.
 Sci. Phil., XVI, pp. 114—, fig. 58, 1914.

 Ohio.
- trinotella Braun, Ent. News., Xi X, p. 99, 1908; Braun, Rev. Am. Lith.,
 p. 279, pl. XXI, fig. 4, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr.,
 Cat., p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 47,
 1914.
- quercialbella Fitch, Fifth Rept. Ins. N. Y., p. 328, 1859; Chambers,
 Can. Ent., 111, p. 57, 1871; Wlsm., Ins. Life., 11, p. 25, 1889; 111,
 p. 325, 1891; Dyar, Cat., No. 5259; Braun, Rev. Am. Lith., p. 279,
 pl. XXI, fig. 5, 1908; Meyr., Gen. Ins., 128, p. 5, 1942; Meyr., Cat.,
 p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116 -, fig. 46, 1944.

- syn: quercibella Chambers, Cin. Quart. Jn. Sei., II, p. 102, 1875; Wlsm., Ins. Life, II, p. 77, 1889; Braun, Rev. Am. Lith., p. 279, 1908.
- syn: quercipulchella Chambers, Bull. Geol. Surv. Terr., IV, p. 120,
 1878; Packard, Bull. Ent. Comm., VII, p. 53, 1881; Wlsm., Ins.
 Life., II, p. 77, 1889; Braun, Rev. Am. Lith., p. 279, 1908; Meyr.,
 Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27.
- syn: quercipulchrella Riley, Smith's List Lep. Bor. Am., p. 109, 1891; Braun, Rev. Am. Lith., p. 279, 1908.

Foodplant: Quercus; under mine.

East. U. S.

- clemensella Chambers, Can. Ent., 111, pp. 57, 85, 1871; XI, p. 91, 1879;
 Wlsm., Ins. Life., 11, p. 25, 1889; Dyar, Cat., No. 6256; Braun, Rev.
 Am. Lith., p. 280, pl. XX1, fig. 6, 1908; Meyr., Gen. 1ns., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Act. Nat. Sci. Phil., XV1, pp. 116—, fig. 45, 1914.
 - Foodplant: Acer saceharum; under mine.

Ohio.

- argentifimbriella Clemens, Proc. Acad. Nat. Sci. Phil., pp. 318, 321, 1859; Tin. No. Am., pp. 39, 64, 70, 1872; Chambers, Can. Ent., 111, pp. 57, 85, 1871; Cin. Quart. Jn. Sci., 1, p. 201, 1874; II, p. 229, 1875; Frey & Boll, Stett. ent. Zeit., XXXIV, p. 209, 1873; Wlsm., Ins. Life., 111, p. 325, 1891; Busck, Proc. Ent. Soc. Wash., V. p. 188, 1903; Dyar, Cat., No. 6258; Braun, Rev. Am. Lith., p. 281; pl. XXI, fig. 7, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 43, 1914.
 - syn: longistriata
 Frey & Boll, Stett. ent. Zeit., XXXIV, p. 209, 1873; Chambers, Cin. Quart. Jn. Sei., II, p. 229, 1875; Wlsm., Ins. Life., II, p. 325, 1891; Braun, Rev. Am. Lith., p. 281, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27.
 - syn: longirostrata I yar, Bull. 52, U. S. Nat. Mus., 550, 1902; Braun, Rev. Am. Lith., p. 281, 1908.
 - syn: fuseocostella Chambers, Cin. Quart. Jn. Sci., II, p. 102, 1875;
 Wlsm., Ins. Life., II, p. 25, 1889; Braun, Rev. Am. Lith., p. 281,
 1908; Meyr., Gen. ins., 128, p. 5, 1912; Meyr., Cat., p. 27.
 - Foodplant: Quereus; under mine. East U. S.
- Iucidicostella Clemens, Proc. Acad. Nat. Sci. Phil., p. 318, 1859; Tin. No. Am., pp. 39, 64, 66, 1872; Chambers, Cin. Quart. Jn. Sci., 11, p. 102, 1875; Can. Ent., 111, p. 57, 1871; Busek, Proc. Ent. Soc. Wash., V., p. 187, 1903; Dyar, Cat., No. 6257; Braun, Rev. Am. Lith., p. 281, pl. XXI, fig. 8, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 44, 1914
- Foodplant: Aeer saccharum. Centr. and North East U. S.
- albanotella Chambers, Cin. Quart. Jn. Sci., II, p. 101, 1875; Dyar, Cat.,
 No. 6263; Braun, Rev. Am. Lith., p. 282, pl. XXI, fig. 9, 1908;
 Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac.
 Nat. Sci. Phil., XVI, pp. 116—, fig. 42, 1914.

syn: subauveola Frey & Boll, Stett. ent. Zeitt., XXXIX. p. 262,
1878; Wlsm., Ins. Life., 1I, p. 25, 1889; 111, p. 325, 1891; Dyar, Cat.,
No. 6260; Braun, Rev. Am. Lith., p. 282, 1908; Meyr., Gen. Ins.,
128, p. 5, 1912.

syn: albinotella Meyr., Meyr., Cat., p. 27.

Foodplant: Quereus; under mine.

Ohio, Ky., Tex. insignis Wlsm., Ins. Life., II, p. 117, 1889; Dyar, Cat., No. 6255; Braun, Rev. Am. Lith., p. 283, pl. XXI, fig. 10, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Ent. News., XXVII, p. 82, 1916; Braun, Jn. Ac. Nat. Sei. Phil., XVI, pp. 115—, fig. 19, 1914.

hageni Frey & Boll, Stett. ent. Zeit.. XXXIV, p. 208, 1873; Chambers, Cin. Quart. Jn. Sei., J, p. 201, 1874; Bull. Geol. Surv. Terr., IV, p. 100; 1878; Dyar, Cat., No. 6252; Braun. Rev. Am. Lith., p. 284 pl. XXI, fig. 11, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sei. Phil., XVI, pp. 115—, fig. 17, 1914. syn: necospinusella Chambers, Bull. Geol. Sur. Terr., IV, p. 100, 1878; Can. Ent., XI, p. 144, 1879; Braun, Rev. Am. Lith., p. 284, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27.

Foodplant: Quereus platanoides; under mine. East U. S.

arbutusella Braun, Rev. Am. Lith., p. 285, pl. XXI, fig. 12, 1908; Meyr.,
Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat.
Sci. Phil., XVI, pp. 115—, fig. 18, 1914.
syn: arbutella Meyr., Meyr., Cat., p. 27.

Foodplant: Arbutus menziesii.

Calif.

obscuricostella Clemens, Proc. Acad. Nat. Sci. Phil., p. 321, 1859; Tin. No. Am., pp. 64, 71, 1872; Chambers, Can. Ent., 111, p. 85, 1871; X1, p. 92, 1879; Busck, Proc. Ent. Soc. Wash., V, p. 188, 1903; Braun. Rev. Am. Lith., p. 286, pl. XX1, fig. 13, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 115—, fig. 25, 1914.

syn: rirginiella Chambers, Can. Ent., 111, p. 84, 1871; Dyar. Cat., No. 6280; Braun, Rev. Am. Lith., p. 286, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 27.

Foodplant: Ostrya virginiana; under mine. Atl. States.

ostryaefoliella Clemens, Proc. Acad. Nat. Sci. Phil., p. 322, 1859; Tin. No. Am., pp. 64, 71, 1872; Chambers, Can. Ent., III, p. 85, 1871; Cin. Quart. Jn. Sci., I, p. 202, 1874; Can. Ent., XI, p. 91, 1879; Wlsm., Ins. Life., II, p. 53, 1889; Busek, Proc. Ent. Soc. Wash., V, p. 188, 1903; Dyar, Cat., No. 6275; Braun, Rev. Am. Lith., p. 286, pl. XXI, fig. 14, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 23, 1914.

syn: mirifica Prey & Boll, Stett. ent. Zeit., XXXIV, p. 212, 1873; Braun, Rev. Am. Lith., p. 287, 1908; Meyr., cen. Ins., 128, p. 6, 1912. syn: ostyrifoliella Meyr., Meyr., Cat., p. 27.

Foodplant: Ostrya virginiana; under mine. Atl. States.

rileyella Chambers, Cin. Quart. Jn. Sci., H, p. 236, 1875; Wlsm., Ins.
Life, H, p. 25, 1889; Dyar, Cat., No. 6254; Braun, Rev. Am. Lith.,
p. 287, pl. XXI, fig. 15, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr.,
Cat., p. 28; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 22, 1914.

syn: tennistrigata Frey & Boll, Stett. ent. Zeit., XXXVII, p. 225, 1876; XXXIX, p. 260, 1878; Braun, Rev. Am. Lith., p. 287, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 28.

Foodplant: Quercus; under mine. Mo., Tex.

kearfottella Braun, Ent. News., XJX, p. 100, 1908; Braun, Rev. Am.
Lith., p. 288, pl. XXI, fig. 10, 1908; Meyr., Gen. Ins., 128, p. 6,
1912; Meyr., Cat., p. 28; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 26, 1914.

Foodplant: Castanea; under mine. Wash., D. C., N. J., Ky. caryaealbeHa Chambers, Can. Ent., III, pp. 58, 85, 182, 206, 1871; Dyar, Cat., No. 6261; Braun, Rev. Am. Lith., p. 289, pl. XXI, fig. 17, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 21, 1914. Wis., Ky. syn: caryalbella Wlsm., Ins. Life., III, p. 328, 1891; Braun, Rev. Am. Lith., p. 289–1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27.

olivaeformis Braun, Rev. Am. Lith., p. 289, pl. XXI, fig. 18, 1908; Meyr., Gen. Ins., 128, p. 5, 1912; Meyr., Cat., p. 27; Braun, Jn. Ac. Nat. Sei. Phil., XVI, pp. 116—, fig. 24, 1914.

syn: oliviformis Meyr., Meyr., Cat., p. 27.

Foodplant: Carya olivaeformis.

martiella Braun, Rev. Am. Lith., p. 290, pl. XXI, fig. 19, 1908; Meyr.,
Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 33; Braun, Jn. Ac. Nat.
Sei. Phil., XVI, pp. 114—, fig. 52, 1914.

Foodplant: Betula? Brit. Col.

gemmea Frey & Boll, Stett. ent. Zeit., XXXIV, p. 218, 1873; Chambers,
Cin. Quart. Jn. Sei., I, p. 206, 1874; H, p. 227; 1875; Can. Ent., XI,
p. 144, 1879; Wlsm., Ins. Life., II, p. 53, 1889; Dyar, Cat., No. 6266;
Braun, Rev. Am. Lith., p. 290, pl. XXI, fig. 20, 1908; Meyr., Gen.
Ins., 128, p. 8, 1912; Meyr., Cat., p. 33; Braun, Jn. Ac. Nat. Sci.
Phil., XVI, pp. 114—, fig. 53, 1914.

Foodplant: Robinia pseudacacia; upper mine. Mass.

diversella Braun, Ent. News., XXVII, p. 83, 1916.

Foodplant: Gaylussacia baccata; Oxydendrum arboreum. Ohio.

morrisella Fitch, Rept. Ins. N. Y., V, p. 336, 1859; Chambers, Can. Ent.,
111, p. 183, 1871; Wlsm., Ins. Life, H, p. 52, 1889; Dyar, Cat., No.
6269; Braun, Rev. Am. Lith., p. 291; pl. XXI, fig. 21, 1908; Meyr.,
Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 33; Braun, Jn. Ac. Nat.
Sci. Phil., XVI, pp. 110—, fig. 48, 1914.

syn: texanella Zeller, Verh. zool-bot; Ges. Wien., XXV, p. 349, 1875;
Frey & Boll, Stett. ent. Zeit., XXXIX, p. 275; 1878; Braun, Rev. Am. Lith., p. 291, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 33.

syn: amphicarpacella Chambers, Bull. Geol. Surv. Terr., III. p. 137, 1877; Braun, Rev. Am. Lith., p. 291, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 33.

Foodplant: Falcata comosa; under side.

U. S.

uhlerella Fitch, Rept. Ins. N. Y., V, p. 337, 1859; Chambers, Can. Ent.,
III, p. 183, 1871; Wlsm., Ins. Life, II, p. 53, 1889; Dyar, Cat., No. 6268; Braun, Rev. Am. Lith., p. 291, pl. XXI, fig. 22, 1908; Meyr.,
Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 114—, fig. 49, 1914.

Foodplant: Amorpha fruticosa; under mine.

robiniella Clemens, Proc. Acad. Nat. Sci. Phil., p. 318, 1859; p. 209, 1860;

Tin. No. Am., p. 66, 1872; Chambers, Can. Ent., HI, pp. 54, 87, 163, 183, 185, 1871; IV, pp. 9, 107, 1872; Cin. Quart. Jn. Sci., II, p. 228, 1875; Bull. Geol. Surv. Terr., III, p. 137, 1877; Jn. Cin. Soc. Nat. Hist., II, p. 91, 1879; Zeller, Verh. zool-bot. Ges. Wien., XXV, p. 347, 1875; Frey & Boll. Stett. ent. Zeit., XXXIX, p. 275, 1878; Busck, Proc. Ent. Soc. Wash., V, p. 189, 1903; Dyar, Cat., No. 6267; Braun, Rev. Am. Lith., p. 292, pl. XXI, fig. 23, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 110—, fig. 50, 1914.

syn: pseudacaciella Fitch, Rept. Ins. N. Y., V. p. 335, 1859; Braun, Rev. Am. Lith., p. 292, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32.

Foodplant: Robinia pseudacacia; upper and under mine. Atl. States. auronitens Frey & Boll, Stett. ent. Zeit., XXXIV, p. 216, 1873; Dyar, Cat., No. 6302; Braun, Rev. Am. Lith., p. 293, pl. XXI, fig. 24, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 115—, fig. 10, 1914.

Foodplant: Alnus serrulata; under mine. Mass.

diaphanella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 265, 1878; Dyar,
Cat., No. 6277; Braun, Rev. Am. Lith., p. 294, pl. XXII, fig. 1,
1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32; Braun,
Jn. Ac. Nat. Sei. Phil., XVI, pp. 116—, fig. 28, 1914.

Foodplant: Quercus; under mine.

Tex.

minutella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 263, 1878; Dyar, Cat., No. 6276; Braun, Rev. Am. Lith., p. 294, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32.

Foodplant: Quercus rubra; under mine.

Texas.

scudderella Frey & Boll, Stett, ent. Zeit., XXXIV, V. 212, 1873; Chambers, Cin. Quart. Jn. Sei., II. p. 230, 1875; Bull. Geol. Surv. Terr., IV, p. 156, 1878; Can. Ent., XI, p. 72, 1879; VII, p. 126, 1875; Dyar, Cat., No. 6278; Braun, Rev. Am. Lith., p. 295, pl. XXII, fig. 2,

1908; Meyr., Gen. ins., 128, p. 7, 1912; Meyr., Cat., p. 32; Braun, Jh. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 35, 1914.

Foodplant: Salix; under mine.

Ohio.

IedeHa Wlsm., Ins. Life., II, p. 79, 1889; Dyar, Cat., No. 6292; Braun, Rev. Am. Lith., p. 296, pl. XXII, fig. 3, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 33, 1914.

Foodplant: Ledum glandulosum; upper mine.

Calif.

salicivorella Braun, Ent. News., XiX, p. 101, 1908; Braun, Rev. Am.
Lith., p. 297, pl. XXII, fig. 4, 1908; Meyr., Gen. Ins., 128, p. 7, 1912;
Meyr., Cat., p. 32; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—,
fig. 29, 1914.

Foodplant: Salix; under mine.

N. J.

deceptusella Chambers, Can. Ent., XI, p. 73, 1879; Wlsm., Ins. Life., III,
p. 328, 1891; Busek, Proc. Ent. Soc. Wash., V, p. 190, 1903; Brauu,
Rev. Am. Lith., p. 298, pl. XXII, fig. 5, 1912; Meyr., Gen. Ins.,
128, p. 7, 1912; Meyr., Cat., p. 32; Braun, Jn. Ac. Nat. Sci. Phil.,
XVI. pp. 116—, fig. 30, 1914.

syn: deceptella Meyr., Meyr., Cat., p. 32.

Foodplant:

Ky.

alnicolella Wlsm., Ins. Life., II, p. 80, 1889; Dyar, Cat., No. 6273; Braun,
Rev. Am. Lith., p. 298, pl. XXII, fig. 6, 1908; Meyr., Gen. Ins.,
128, p. 7, 1912; Meyr., Cat., p. 31; Braun, Jn. Ac. Nat. Sci. Phil.,
XVI, pp. 116—, fig. 32, 1914.

Foodplant: Alnus incana; upper mine.

Calif.

alni Wlsm., Ins. Life., III, p. 326, 1891; Dyar, Cat., No. 6274; Braun, Rev. Am. Lith. p. 299, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 31; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 31, 1914.
syn: alnivorella Chambers, (not Ragonot), Cin. Quart. Jn. Sci., II, p. 302, 1875; Bull. Geol. Surv. Terr., III, p. 139, 1877; Braun, Rev. Am. Lith., p. 299, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 31.

Foodplant: Alnus; under mine.

malimalifoliella Braun, Ent. News., XIX, p. 101, 1908; Braun, Rev. Am.
 Lith., p. 300, pl. XXII, fig. 7, 1908; Meyr., Gen. Ins., 128, p. 7, 1912;
 Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 37, 1914.
 syn: malifoliella Meyr., Meyr., Cat., p. 30.

Foodplants: Malus, Cratacgus; under mine.

Crataegella Clemens, Proc. Acad. Nat. Sci. Phil., p. 324, 1859; p. 208, 1860; Tin. No. Am., pp. 76, 141, 1872; Chambers, Can. Ent., III. pp. 55, 108, 1871; V, p. 50, 1873; XI, p. 73, 1879; Bull. Geol. Surv. Terr., IV, p. 100, 1878; Wlsm., Trans. Am. Ent. Soc., X, p. 202 1882; Busck, Proc. Ent. Soc. Wash., V, p. 190, 1903; Braun, Rev. Am. Lith., p. 301, pl. XXII, fig. 8, 1908; Meyr., Gen. Ins., 128, p.

7, 1912; Meyr., Cat., p. 30; Braun, Jn. Ac. Nat. Sci. Phil., XVI,

pp. 109—, fig. 36, 1914.

Foodplants: Crataegus, Malus, and Prunus; under mine. East. U. S. propinquinella Braun, Rev. Am. Lith., p. 302, pl. XXII, fig. 9, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 30; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 38, 1914.

Foodplant: Prunus serotina; under mine.

incanella Wlsm., Ins. Life., II, p. 81, 1889; Dyar, Cat., No. 6272; Braun, Rev. Am. Lith., p. 302, pl. XXII, fig. 10, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 31; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 34, 1914.

Foodplant: Alnus ineana; under mine and upper mine. Calif. populiella Chambers, Bull. Geol. Surv. Terr., IV, p. 101, 1878; Dyer, Cat., No. 6331; Braun, Rev. Am. Lith., p. 303, pl. XXII, fig. 11, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 31; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116⊢, fig. 27, 1914.

Foodplant: Populus alba; under mine. Ohio, Ky.

sexnotella Chambers, Jn. Cin. Soc. Nat. Hist., II, p. 189, 1879; Dyar,
Cat., No. 6282; Braun, Rev. Am. Lith., p. 304, pl. XXII, fig. 12,
1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 29; Braun,
Jn. Ac. Nat. Sei. Phil., XVI, pp. 116—, fig. 39, 1914.
Ky., Pa.

aeriferella Clemens, Proc. Acad. Nat. Sci. Phil., p. 320, 1859; Tin. No. Am., pp. 64, 68, 1872; Chambers, Can. Ent., III, p. 183, 1871; Cin. Quart. Jn. Sci., II, p. 104, 1875; Busck, Proc. Ent. Soc. Wash. V, p. 187, 1903; Dyar, Cat., No. 6281; Braun, Rev. Am. Lith., p. 305, pl. XXII, fig. 13, 1908; Meyr, Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 29; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 116—, fig. 40, 1914.

Foodplant: Quercus imbricaria; under mine. Pa., Ohio.

obsoleta Frey & Boll, Stett. ent. Zeit., XXXIV, p. 211, 1873; Chambers,
Cin. Quart, Jn. Sei., I, p. 202, 1874; Dyar, Cat., No. 6279; Braun,
Rev. Am. Lith., p. 306, pl. XXII, fig. 14, 1908; Meyr, Gen., Ins., 128,
p. 6, 1912; Meyr., Cat., p. 29; Braun, Jn. Ac. Nat. Sei. Phil., XVI,
pp. 116—, fig. 41, 1914.

syn: obsoletella Chambers, Bull. Geol. Surv. Terr., IV, p. 155, 1878; Braun, Rev. Am. Lith., p. 306, 1908. Mass.

argentinotella Clemens, Proc. Acad. Nat. Sci. Phil., p. 321, 1859; Tin. No. Am., pp. 66, 78, 1872; Chambers, Can. Ent., III, p. 148, 1871; XI, p. 89, 1879; Frey & Boll, Stett. ent. Zeit., XXXIV, p. 213, 1873; Chambers, Cin. Quart. Jn. Sci., I, p. 202, 1874; II, p. 101, 1875; Bušek, Proc. Ent. Soc. Wash., V, p. 190, 1903; Dyar, Cat., No. 6283; Braun, Rev. Am. Lith., p. 306, pl. XXII, fig. 15, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 31; Braun, Jn. Ac. Nat. Sci. Phil, XVI, pp. 115—, fig. 11, 1914.

Foodplant: Ulmus; under mine. East, U. S.

occitanica Frey & Boll, Stett, ent. Zeit., XXXVII, p. 224, 1876; XXXIIX, p. 270, 1878; Dyar, Cat., No. 6281; Braun, Rev. Am. Lith., p. 307.

1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 31; Braun, Jn. Ac. Nat, Sci. Phil., XVI, pp. 115—, fig. 12, 1914.

Foodplant: Ulmus julva; under mine.

Tex.

apicinigrella Braun, Rev. Am. Lith., p. 307, pl. XXII. fig. 16, pl. XXIV,
fig. 23, 1908; Meyr., Gen. Ins., 128, p. 7, 1912; Meyr., Cat., p. 32;
Braun, Jn. Ac. Nat. Sci. Phil., XVI, 114—, figs. 55a, 55b, 1914.

Foodplant: Salix; under mine.

Calif., Wash.

basistrigella Clemens, Proc. Acad. Nat. Sci. Phil., p. 321, 1859; Tin. No. Am., pp. 39, 65, 69, 1872; Chambers, Can. Ent., HI, p. 148, 166, 182, 1871; Cin. Quart. Jn. Sci., I, p. 205, 1874; Wlsm., Ins. Life., II, p. 25, 1889; Busek, Proc. Ent. Soc. Wash., V, p. 188, 1903; Dyar, Cat., No. 6301; Braun, Rev. Am. Lith., p. 308, pl. XXII, fig. 17, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 28; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 114—, fig. 57, 1914.

syn: intermedia Frey & Boll, Stett. ent. Zeit., XXXIV, p. 210, 1873; Chambers, Cin. Quart. Jn. Sci., II, p. 230, 1875; Braun, Rev. Am. Lith., p. 308, 1908; Meyr., Gen. Ins., 128, p. 6, 1912; Meyr., Cat., p. 28.

Foodplant: Quercus; under mine.

Calif. and Ore.

celtisella Chambers, Can. Ent., 111, p. 129, 1871; Cin. Quart. Jn. Sci..
I, p. 201, 1874; Bull. Geol. Surv. Terr., IV. p. 117, 1878; Frey & Boll, Stett. ent. Zeit., XXXIX, p. 274, 1878; Chambers, Jn. Cin. Soc. Nat. Hist., I1, p. 190, 1879; Wlsm., Ins. Life., II, p. 52, 1889; Braun, Rev. Am. Lith., p. 309, pl. XXII, fig. 18, 1908; Meyr., Gen. Ins., 128, p. 9, 1912; Meyr., Cat., p. 37; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 114—, fig. 56, 1914.

syn: nonfasciella Chambers, Can. Ent., III, p. 108, 1871; Cin. Quart.
Jn. Sci., I, p. 201, 1874; Braun, Rev. Am. Lith., p. 309, 1908; Meyr.,
Gen. Ins., p. 9, 1912; Meyr., Cat., p. 37.

syn: pusillifoliella Frey & Boll, Stett. ent. Zeit., XXXVII, p. 226, 1876; Stett. ent. Zeit., XXXIX, p. 274, 1878; Braun, Rev. Am. Lith, p. 309, 1908; Meyr., Gen. Ins., 128, p. 9, 1912; Meyr., Cat., p. 37.

syn: celtiella Meyr., Meyr., Cat., p. 37.

Foodplant: Celtis occidentalis; first under, then upper mine.

Ky., Ohio.

lucetiella Clemens, Proc. Acad. Nat. Sci. Phil., pp. 319, 322, 1859; Tin. No. Am., pp. 65, 73, 1872; Chambers, Can. Ent., 111, p. 56, 1871; Wlsm., Ins. Life., 11, p. 52, 1889; Busek, Proc. Ent. Soc. Wash., V, p. 188, 1903; Dyar, Cat., No. 6262; Braun, Rev. Am. Lith., p. 310, pl. XXII, fig. 19, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 114—, fig. 51, 1914.

syn: aenigmatella Frey & Boll, Stett. ent. Zeit., XXXIV, p. 219, 1873; Chambers, Cin. Quart. Jn. Sei., I, p. 210, 1874; Braun, Rev.

Am. Lith., p. 310, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34.

Foodplant: Tilia americana; under mine.

Atl. States.

symphoricarpella Chambers, Cin. Quart. Jn. Sei., H, p. 98, 1875; Dyar,
Cat., No. 6311; Braun, Rev. Am. Lith., p. 311, pl. XXII, fig. 20,
1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34; Braun,
Jn. Ac. Nat. Sei. Phil., XVI, pp. 114—, fig. 54, 1914.

syn: symphoricarpella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 271, 1878; Braun, Rev. Am. Lith., p. 311, 1908.

syn: bolliella Dyar, Cat., No. 6312; Braun, Rev. Am. Lith., p. 341, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34.

Foodplant: Symphoricarpos; under mine.

Ohio, Ky., Texas.
ostensackenella Fitch, Rept. Ins. N. Y., V, p. 338, 1859; Chambers, Can.
Ent., 1H, p. 183, 1871; Dyar, Cat., No. 6265; Braun, Rev. Am. Lith.,
p. 311, pl. XXII, fig. 21, 1908; Meyr., Gen. Ins., 128, p. 8, 1912;
Meyr., Cat., p. 34; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 110—,
fig. 7, 1914.

syn: ornatella Chambers, Can. Ent., III, p. 161, 1871; IV, p. 107, 1872; XI, p. 91, 1879; Zeller, Verh. zool-bot. Ges. Wien., XXV, p. 347, 1875; Frey & Boll, Stett. ent. Zeit., XXXIV, p. 217, 1873; Wlsm., Ins. Life., II, p. 53, 1889; Braun, Rev. Am. Lith., p. 311, pl. XXII, fig. 21, 1908; Meyr., Gen. Ins., 128, p. 8, 1942; Meyr., Cat., p. 34.

Foodplant: Robinia; upper and under mine.

tritaenianella Chambers, Can. Ent., III, pp. 110, 184, 1871; V, p. 48, 1873; XI, p. 89, 1879; Wlsm., Ins. Life., II, p. 53, 1889; Braun, Rev. Am. Lith., p. 312, pl. XXII, fig. 22, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 112—, fig. 5, 1914.

syn: tritaeniella Dyar, Cat., No. 6316; Braun, Rev. Am. Lith., p. 312, 1908; Meyr., Cat., p. 34.

syn: consimilella Frey & Boll, Stett. ent. Zeit., XXXIV, p. 214, 1873; Chambers, Cin. Quart. Jn. Sei., 1, p. 202, 1874; H, p. 130, 1875; Wlsm., Ins. Life. H, p. 51, 1889; Braun, Rev. Am. Lith., p. 312, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34.

Foodplant: Ostrya virginiana; upper mine.

Atl. States.

affinis Frey & Boll, Stett, ent. Zeit., XXXVII, p. 222, 1876; XXXIX,
p. 270, 1878; Wlsm., Ins., Life., II, p. 51, 1889; Dyar, Cat., No. 6314;
Braun, Rev. Am. Lith., p. 313, 1998; Meyr., Gen. Ins., 128, p. 8,

1912; Meyr., Cat., p. 34; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp.

112-, fig. 6, 1914.

Foodplants: Lonicera and Symphoricarpos; under mine. Tex. mariaeella Chambers, Cin. Quart. Jn. Sci., II, p. 99, 1875; Can. Ent.. XI, p. 92, 1879; Wlsm. Trans. Am. Ent. Soc., X, p. 201, 1882; Dyar Cat., No. 6315; Braun, Rev. Am. Lith., p. 313, pl. XXII, fig. 23

1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34; Braun, Jn., Ac. Nat. Sci. Phil., XVI, pp. 113--, fig. 8, 1914.

syn: mariella Riley, Smith's List Lep. Bor. Am., p. 190, 1891; Braun, Rev. Am. Lith., p. 313, 1908; Meyr., Cat., p. 34.

Foodplant: Symphoricar pos vulgaris; under mine. Mo.

tiliacella Chambers, Gan. Ent., III, p. 56, 1871; Dyar, Cat., No. 6310; Braun, Rev. Am. Lith., p. 314, pl. XXII, fig. 24, 1908; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 111—, fig. 1, 1914.

syn: tiliaeella Chambers, Cin. Quart. Jn. Sci., I. p. 203, 1874; Braun, Rev. Am. Lith., p. 314, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34.

syn: tiliella Wilsm., Ins. Life., III, p. 328, 1891; Braun, Rev. Am. Lith. p. 314, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34.

Foodplant: Tilia americana; upper mine. Atl. States.

oregonensis Wlsm., Ins. Life., II, p. 117, 1889; Dyar, Cat., No. 6309; Braun, Rev. Am. Lith., p. 314, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 112—, fig. 2, 1914.

fragilella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 270, 1878; Wlsm.
Ins. Life., II, p. 51, 1889; Dyar, Cat., No. 6313; Braun, Rev. Am.
Lith., p. 315, pl. XXIII, fig. 1, 1908; Meyr., Gen. Ins., 128, p. 8, 1912; Meyr., Cat., p. 34; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 112—, fig. 3, 1914.

syn: trifasciella Frey & Boll, (not Haworth), Stett. ent. Zeit., XXXIV, p. 215, 1873; Chambers, Cin. Quart. Jn. Sci., I, p. 205, 1874; Wlsm., Ins. Life., III, p. 326, 1891; Braun, Rev. Am. Lith., p. 315, 1908.

Foodplant: Lonicera; under mine.

East. U. S.

salicifoliella Clemens, Proc. Ent. Soc. Phil., I, p. 81, 1861; Tin. No. Am., p. 169, 1872; Packard, Guide Stud. Ins., p. 353, 1869; Chambers Can. Ent., III, pp. 163, 185, 1871; Cin. Quart. Jn. Sci., II, p. 302, 1875; Can. Ent., VII, p. 126, 1875; Bull. Geol. Surv. Terr., III, p. 139, 1877; Wlsm., Ins. Life., II, p. 54, 1889; Dyar, Cat., No. 6333; Braun, Rev. Am. Lith., p. 316, pl. XXIII, figs. 2, 3, pl. XXIV, fig. 24, 1908; Meyr., Gen. Ins., 128, p. 9, 1912; Meyr., Cat., p. 37; Braun Jn. Ac. Nat. Sci. Phil., XVI, pp. 115—, fig. 15, 1914.

syn: atomariella Zeller, Verh. zool-bot. Ges. Wien., XXV, p. 350, 1875; Wlsm., Ins. Life., H, p. 54, 1889; Dyar, Cat., No. 6332; Braun, Rev. Am. Lith., p. 316, 1908; Meyr., Gen. Ins., 128, p. 9, 1912.

Foodplants: Salix and Populus; under mine. U. S.

tremuloidiella Braun, Ent. News., XIX, p. 102, 1908; Braun, Rev. Am.
Lith., p. 317, pl. XXIII, fig. 4, 1908; Meyr., Gen. Ins., 128, p. 9,
1912; Meyr., Cat., p. 37; Braun, Jn. Ac. Nat. Sci. Phil., XVI, pp. 115—, fig. 16, 1914.

Foodplant: Populus tremuloides; under mine.

Brit. Co.

celtifoliella Chambers, Can. Ent., III, p. 128, 1871; Bull. Geol. Surv.
Terr., IV, p. 118, 1878; Wlsm., Ins. Life., II, p. 52, 1889; Dyar, Cat.,
No. 6286; Braun, Rev. Am. Lith., p. 319, pl. XXIII, fig. 5, 1908;
Meyr., Gen. Ins., 128, p. 9, 1912; Meyr., Cat., p. 37; Braun, Jn. Ac.
Nat. Sci. Phil., XVI, pp. 112—, fig. 4, 1914.

Foodplant: Celtis occidentalis; under mine. Ky., Ohio, W. Va.

Iysimachiaeella Chambers, Cin. Quart. Jn. Sci., II. p. 100, 1875; Wlsm., Ins. Life., 11, p. 77, 1889; Dyar, Cat., No. 6336; Braun, Rev. Am., Lith., p. 320, 1908.

Foodplant: Lysimachia lanccolata; under mine. (Larva described, adult not known.)

CREMASTOBOMBYCIA Braun.

Rev. Am. Lith., p. 349, pl. XX, figs. 6, 7, 13, 1908.

Type: solidaginis Frey & Boll.

grindeliella Wlsm., Ins. Life., 111, p. 327, 1891; Dyar, Cat., No. 6299;
Braun, Rev. Am. Lith., p. 350, pl. XXIV, figs. 16, 22, 1908; Meyr.,
Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41; Braun, Jn. Ac. Nat.
Sei. Phil., XVI, pp. 157—, fig. 59a, 59b, 1914.

Foodplant: Grinde'ia robusta; upper or lower mine. Calif.

solidaginia Frey & Boll, Stett. ent. Zeit., XXXVII, p. 223, 1876; Dyar,
Cat., No. 6298; Braun, Rev. Am. Lith., p. 351, pl. XXIV, fig. 17,
1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr. Cat., p. 41; Braun. Jn.
Ac. Nat. Sci. Phil., XVI, pp. 124—, fig. 60, 1914.

syn: solidaginisella Chambers, Jn. Cin. Soc. Nat. Hist., H, p. 190, 1880; Braun, Rev. Am. Lith., p. 351, 1908.

Foodplant: Solidago; under mine. U. S.

ambrosiella Chambers, Can. Ent., 111, p. 127, 1871; Cin. Quart. Jn. Sci.,
11, p. 100, 1875; Frey & Boll, Stett. ent. Zeit., XXXVII, p. 221,
1876; XXXIX, p. 267, 1878; Wlsm., Ins. Life., 11, p. 54, 1889; Dyar.
Cat., No. 6321; Braun, Rev. Am. Lith., p. 352, pl. XXIV, fig. 18,
1908; Meyr. Gen., Ins., 128, p. 41, 1912; Meyr., Cat., p. 41; Braun.
Jn. Ac. Nat. Sci. Phil., XVI, pp. 157—, fig. 61, 1914.

syn: amoena Frey & Boll, Stett. ent. Zeit., XXXIX, p. 269, 1878; Dyar, Cat., No. 6285; Braun, Rev. Am. Lith., p. 352, 1908; Meyr.,

Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41.

Foodplants: Ambrosia and Verbesina; under mine. Atl. States, Tex.
Ignota Frey & Boll, Stett. ent. Zeit., XXXIV, p. 215, 1873; Chambers,
Cin. Quart, Jn. Sei., I, p. 206, 1874; H, p. 230, 1875; Wlsm., Ins.
Life., H, pp. 54, 119, 1889; Dyar., Cat., No. 6320; Braun, Rev. Am.
Lith., p. 353, pl. XXIV, figs. 19, 20, 1908; Meyr., Gen. Ins., 128,
p. 11, 1912; Meyr. Cat., p. 41; Braun; Jn. Ac. Nat. Sci. Phil., XVI,
pp. 124—, fig. 62, 1914.

syn: bostonica Frey & Boll, Stett. ent. Zeit., XXXIV, p. 216, 1873;
Chambers, Cin. Quart. Jn. Sci., I, p. 206, 1874; Dyar, Cat., No. 6319; Braun, Rev. Am. Lith., p. 353, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41.

syn: helianthisella Chambers, Cin. Quart. Jn. Sei., I, p. 205, 1874;
Braun, Rev. Am. Lith., p. 353, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41.

syn: helianthivorella Chambers, Cin. Quart. Jn. Sei., II, p. 100, 1875;Braun, Rev. Am. Lith., p. 353, 1908; Meyr., Gen. Ins., 128, p. 11, 1912;Meyr., Cat., p. 41.

syn: elephantopodella Frey & Boll, Stett. ent. Zeit., XXXIX, p. 268, 1878; Busck, Proc. U. S. Nat. Mus., XXIII, p. 247, 1900; Dyar, Cat., No. 6322; Braun, Rev. Am. Lith., p. 353, 1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41.

syn: actinomeridis Frey & Boll, Stett. ent. Zeit., XXXIX, p. 268,
1878; Dyar, Cat., No. 6324; Braun, Rev. Am. Lith., p. 353, 1908;
Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41.

Foodplants: Verbesina, Elephantopus, Helianthus; under mine.

Atl. States, Tex.

verbesinella Busck, Proc. U. S. Nat. Mus., XXIII, p. 246, 1900; Dyar,
Cat., No. 6323; Braun, Rev. Am, Lith., p. 354, pl. XXIV, fig. 21,
1908; Meyr., Gen. Ins., 128, p. 11, 1912; Meyr., Cat., p. 41; Braun,
Jn. Ac. Nat. Sci. Phil., XVI, pp. 157—, fig. 63, 1914.

Foodplant: Verbesina virginica; under mine.

Fla.

MARMARA Clemens.

Proc. Ent. Soc. Phil., II, p. 6, 1863.

Type: salictella Clem.

Aesyle, Chambers, Cin. Quart. Jn. Sei., II, p. 98, 1875.

Type: Marmara jasciella, Cham.

salictella Clemens, Proc. Ent. Soc. Phil., II, p. 7, 1863; Tin. No. Am.,
p. 212, 1872; Dyar. Cat., No. 6403; Busek, Jn. N. Y. Ent. Soc.,
X, p. 98, 1902; Proc. U. S. Nat. Mus., XXIII, p. 246, 1900; Proc.
Ent. Soc. Wash., V, p. 210, 1903; Meyr., Gen. Ins., 128, p. 12, 1912;
Meyr., Cat., p. 42.

syn: Salicella Cham., Bull. Geol. Surv. Terr., IV, p. 156, 1878.

Foodplant: Salix. Atl. States.

serotinella Busck. Proc. Wash. Ent. Soc., XVII, p. 89, 1915.

Foodplant: Prunus serotina. Va. vilandinella Busck, Proc. U. S. Nat. Mus., XXIII, p. 245, 1900; Meyr.,

guilandinella Busck, Proc. U. S. Nat. Mus., XXIII, p. 245, 1900; Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42.

syn: guilandinae Dyar, Cat., No. 6404.

Foodplant: Guilandina bonducel a.

Fla.

fulgidella Clemens, Proc. Acad. Nat. Sci. Phil., p. 6, 1860; Proc. Ent. Soc. Phil., V, p. 145, 1865; Tin. No. Am., p. 92, 1872; Busek, Proc. Ent. Soc. Wash., V, p. 195, 1903; Dyar, Cat., No. 6357; Meyr., Gen. Ins., p. 26, 1912; Meyr., Cat., p. 54.

Foodplants: Quereus and Castanea.

Atl. States.

elotella Busck, Proc. Wash. Ent. Soc., XI, p. 102, 1909; Meyr., Gen. Ins., p. 26, 1912; Meyr., Cat., p. 54; Busek, Proc. Wash. Ent. Soc., XV, p. 150, 1913.

Foodplant: Malus.

Conn., Mass.

opuntiella Busck, Proc. Ent. Soc. Wash., IX, p. 97, 1907; Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42.

Foodplant: Opuntia.

Tex.

arbutiella Busck, Proc. U. S. Nat. Mus., XXVII, p. 772, 1904; Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42.

Foodplant: Arbutus menziesi.

Wash., Ore.

fasciella Chambers, Cin. Quart. Jn. Sci., II, p. 98, 1875; Can. Ent., VII, p. 93, 1875; IX, pp. 123, 194, 1877; XI, p. 118, 1879; Wlsm., Trans. Am. Ent. Soc., X, p. 201, 1882; Dyar, Cat., No. 6356; Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44.

Syn: quinquenotella Chambers, Can. Ent., IX. p. 124, 1877; Meyr., Gen. Ins., p. 16, 1916; Meyr., Cat., p. 44. Atl. States.

pomonella Busek, Proc. Wash. Ent. Soc., XVII, p. 89, 1915.

Ore.

Foodplant: Malus. (*) aura tella Braun, Can. Ent., XLVII, p. 192, 1915.

Foodplant: Rudbeckia laciniata.

Ohio.

(*) apocynella Braun, Can. Ent., XLVII, p. 193, 1915.

Foodplant: A pocynum cannabium.

Ohio.

(*) Smilacicella Braun, Ent. News., Phil., XX, p. 432, 1909; Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42.

Syn: Smilaciella Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42. Foodplant: Smilax hispida.

Ky., Ohio.

LEUCANTHIZA Clemens.

Proc. Acad. Nat. Sci. Phil., p. 327, 1859.

Type: Leucanthiza amphicarpeacfoliella Clem.

amphicarpeaefoliella Clemens, Proc. Acad. Nat. Sci. Phil., p. 327, 1859; Tin. No. Am., p. 85, 1872; Chambers, Can. Ent., III, p. 162, 1871; Dyar, Cat., No. 6402; Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42; Busek, Proc. Ent. Soc. Wash., V, p. 191, 1903.

syn: saundersella Chambers, Can. Ent., 111, p. 205–1871; Meyr. Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42.

syn: amphicarpeifoliella Meyr., Gen. Ins., p. 12, 1912; Meyr., Cat., p. 42.

Foodplant: Amphicarpaea monoica.

Atl. States.

(*) dircella Braun, Ent. News., XXV, p. 115, 1914. Foodplant: Dirca palustris.

Ohio.

NEUROLIPA Nov. Gen.

Type: Neurolipa randiella Busck.

randiella Busck, Proc. U. S. Nat. Mus., XXIII, p. 247, 1900; Dyar, Cat., No. 6399; Meyr., Gen. Ins., p. 21, 1912; Meyr., Cat., p. 49.

Foodplant: Randia aculeata.

Fla.

APOPHTHISIS Braun

Can. Ent., XLVII, p. 190, 1915.

(*) Type: Apophthisis pullata Braun, Can. Ent., XLVII, p. 191, 1915.

LEUCOSPILAPTERYX Spuler.

Schmett., Eur. B. 2, p. 408, 1910.

Type: Leucospilapteryx omissella, Stainton.

venustella Clemens, Proc. Ac. Nat. Sci. Phil., p. 6, 1860; Proc. Ent. Soc. Phil., II, p. 10, 1863; V, p. 145, 1865; Tin. No. Am., pp. 92, 216, 269, 1872; Dyar, Cat., No. 6375; Busek, Proc. Ent. Soc. Wash., V. p. 195, 1903; Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44, syn: cupatoriclla Chambers, Can. Ent., IV, p. 9, 1872; V, pp. 44, 46,

1873; Dyar, Cat., No. 6375; Busek, Proc. Ent. Soc. Wash., V. p. 195, 1903; Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44.

Foodplant: Eupatorium ageratoides.

Atl. States.

CHILOCAMPYLA Busck.

Proc. U. S. Nat. Mus., XXIII, p. 248, pl. 1, fig. 15, 1900. Type: Chilocampula duariella Busek.

dyariella Busek, Proc. U. S. Nat. Mus., XXIII, p. 249, 1900; Dyar, Cat., No. 6339; Meyr., Gen. Ins., p. 25, 1912; Meyr., Cat., p. 53.
Foodplant: Eugenia garbari.

NEUROSTROTA Ely.

Type: Neurostrota quaniella Busek.

gunniella Busck, Proc. U. S. Nat. Mus., XXX, p. 731, 1906; Meyr., Gen. 7ns., p. 16, 1912; Meyr., Cat., p. 44.
Tex.

ACROCERCOPS Wallengren.

Ent. Tidskr., II, p. 95, 1881.

Type: Acrocercops brogniardellum, Fabr.

- Dialectica Wlsm., Proc. Zool. Soc. Lond., p. 150, 1897.

Type: Acrocercops scalariella Zell.

Eutrichoenemis Spuler, Schmett, Eur. Band 2, p. 409, 1910.
 Type: Acrocercops scalariella Zell.

- albinatella Chambers, Can. Ent., IV, pl. 25, 1872; Dyar, Cat., No. 6396; Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44.
 - syn: albanotella Chambers, Can. Ent., IX, p. 123, 1877; Cin. Quart. Jn. Sci., I, p. 200, 1874; Bull. Geol. Surv. Terr., III, p. 132, 1877.

syn: albinotella Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44.

- Foodplant: Quercus.

 Ky., Md., N. Y.

 quinquestrigella Chambers, Can. Ent., VII, p. 75, 1875; IX, pp. 14,
 124, 1877; X, p. 109, 1878; Dyar, Cat., No. 6398; Meyr., Gen. Ins.,
- p. 21, 1912; Meyr., Cat., p. 49. Ky., Tex. rhombiferellum Frey & Boll, Stett. ent. Zeit., XXXVII, p. 212, 1876; Dyar, Cat., No. 6400; Meyr., Gen. Ins., p. 21, 1912; Meyr., Cat., p,
 - syn: rhombiferella Meyr., Gen. Ins., p. 21, 1912; Meyr., Cat., p. 49.

Tex

- astericola Frey & Boll, Stett. ent. Zeit., XXXIV, p. 204, 1873; Chambers,
 Cin. Quart. Jn. Sei., II, p. 200, 1875; Dyar, Cat., No. 6345; Meyr.,
 Gen. Ins., p. 20, 1912; Meyr., Cat., p. 48.
 - Foodplant: Aster corditolius. Mass., Pa.

(†) strigosa Braun, Ent. News., Phil., XXV, p. 116, 1914.

Foodplant: Quercus prinus. Ky., N. C.

- onosmodiella Bušek, Proc. U. S. Nat. Mus., XXV, p. 409, 1902; Meyr., Gen. Ins., p. 15, 1912; Meyr., Cat., p. 43.
 - syn: pnosmodiella Busck, Proc. U. S. Nat. Mus., XXV, p. 409, 1902; Dyar, Cat., No. 6385.

Foodplant: Onosmodium carolinianum. Col.

- [†] sideroxylonella Busck, Proc. U. S. Nat. Mus., XXIII, p. 250, 1900, Meyr., Gen. Ins., p. 18, 1912; Meyr., Cat., p. 46.
 - syn: sideroxylella Meyr., Gen. Ins., p. 18, 1912; Meyr., Cat., p. 46. Foodplant: Sideroxylon pallidum. Fla.

NEUROBATHRA Ely.

Type: Neurobathra strigifinitella Clem., Proc. Ac. Nat. Sci. Phil., p. 6, 4860,

- strigifinitella Clemens, Proc. Ac. Nat. Sci. Phil., p. 6, 1860; Tin. No. Am., p. 92, 1872; Dyar, Cat., No. 6370; Busek, Proc. Ent. Soc. Wash., V. p. 195, 1903; Meyr., Gen. Ins., p. 17, 1912; Meyr., Cat., p. 45; Heinrich and DeGryse, Proc. Ent. Soc. Wash., XVII, p. 6, 1915.
 - syn; duodecemlineella Chambers, Can. Ent., IV, p. 11, 1872; Dyar, Cat., No. 6371; Busek, Proc. Ent. Soc. Wash., V, p. 195, 1903; Meyr., Cat., p. 45.
 - (*) syn: quercifoliella Chambers, Cin. Quart. Jn. Sci., II, p. 116, 1875; Dyar, Cat., No. 6393; Busek, Proc. Ent. Soc. Wash., V. p. 195, 1903; Meyr., Cat., p. 45.
 - Foodplants: Quercus, Castanea and Fagus.

Atl. States.

MICRURAPTERYX Spuler.

Schmett., Eur. B. 2, p. 409, 1910.

Type: Micrurapteryx kollariclla Zell.

salicifoliella Chambers, Can. Ent., IV, p. 25, 1872; V, pp. 15, 46, 186, 1873; Cin. Quart. Jn. Sei., I. p. 340, 1874; Dyar, Cat., No. 6365; Meyr., Gen. Ins., p. 21, 1912; Meyr., Cat., p. 49.

Foodplant: Salix.

Atl. States.

PARECTOPA Clemens.

Proc. Acad. Nat. Sci. Phil., p. 210, 1860.

Type: Parectopa lespedezaefoliella Clem.

1espedezaefoliella Clemens, Proc. Acad. Nat. Sci. Phil., p. 210, 1860;
Tin. No. Am., p. 144, 1872; Chambers, Can. Ent., IV, p. 7, 1872; V.
p. 47, 1873; VIII, p. 19, 1876; Bull. Geol. Surv. Terr., III, p. 132, 1877; Dyar, Cat., No. 6364; Busck, Proc. Ent. Soc. Wash., V. p. 205, 1903.

syn: lespedezijoliella Meyr., Gen. Ins., 120, p. 20, 1912; Meyr., Cat., p. 48.

syn: mirabilis Frey & Boll, Stett. ent. Zeit., XXXIV, p. 203, 1873;
Chambers, Cin. Quart. Jn. Sci., II, p. 227, 1875; Meyr., Gen. Ins., 128, p. 20, 1912; Meyr., Cat., p. 48; Busek, Proc. Ent. Soc. Wash., V, p. 205, 1903.

Foodplant: Lespedeza violacea.

Atl. States.

robinella Clemens, Proc. Ent. Soc. Phil., 11, p. 4, 1863; Tin. No. Am., p. 207, 1872; Chambers, Can. Ent., 111, p. 87, 1871; IV, p. 7, 1872; V, p. 47, 1873; VIII, p. 33, 1876; Bull. Geol. Surv. Terr., 111, p. 132, 1877; Wlsm., Trans. Am. Ent. Soc., X, p. 193, 1882; Dyar, Cat., No. 6364; Meyr., Gen. Ins., 128, p. 20, 1912; Meyr., Cat., p. 48; Busek, Proc. Ent. Soc. Wash., V, p. 210, 1903.

Foodplant: Robinia pseudacacia. Atl. State

pennsylvaniella Engel, Ent. News, XVIII, p. 278, 1907; Meyr., Gen. Ins., 128, p. 20, 1912; Meyr., Cat., p. 49; Braun, Ent. News., XXV, p. 117, 1914.

Foodplant: Aster corditolius. Ohio, Pa., Conn.

(†) plantaginisella Chambers, Can. Ent., IV, p. 10, 1872; V, p. 46, 1873;
 Dyar, Cat., No. 6353; Meyr., Gen. Ins., p. 20, 1912; Meyr., Cat., p. 48.

syn: geiella, Chambers, Cin. Quart. Jn. Sci., I, p. 200, 1874; Dyar, Cat., No. 6353; Meyr., Gen. Ins., p. 20, 1912; Meyr., Cat., p. 48.

syn: crigeronella Chambers, Can. Ent., IX, p. 127, 1877; Bull. Geol.
Surv. Terr., IV, p. 148, 1878; Dyar, Cat., No., 6353; Meyr., Gen. Ins.,
p. 20, 1912; Meyr., Cat., p. 48.

syn: plantaginella Meyr., Gen. ins., p. 20, 1912; Meyr., Cat., p. 48. Foodplant: Erigeron. **Ky.**

(†) thermopsella Chambers, Cin. Quart. Jn. Sci., 11, p. 309, 1875; Bull. Geol. Surv. Terr., 144, p. 132, 1877; Dyar. Proc. U. S. Nat. Mus., XXV, p. 409, 1902; Dyar, Cat., No. 6374; Meyr., Gen. Ins., p. 20, 1912; Meyr., Cat., p. 48.

Foodplant: Thermopsis montana.

Col.

bosquella Chambers, Can. Ent., VIII, p. 33, 1876; Bull. Geol. Surv. Terr., III, p. 132, 1877; Dyar, Cat., No. 6350; Meyr., Gen. Ins., p. 20, 1912; Meyr., Cat., p. 49.

(*) interpositella Frey & Boll., Stett. ent. Zeit., XXXVII, p. 211, 1876; Dyar, Cat., No. 6381; Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44.
Tex.

PARORNIX Spuler.

Schmett., Eur., B. 2, p. 410, 1910.

Type: Parornix anglicella Stainton.

- = Ornix Treitschke, Schmett., Eur., IX (2), p. 192, 1833. (See Walsingham, Biol. Centr. Am., p. 341, 1915.)
- (*) boreasella Clemens, Proc. Ent. Soc. Phil., II, p. 415, 1864; Tin. No. Am., p. 237, 1872; Dyar, Cat., No. 6389; Busek, Proc. Ent. Soc. Wash., p. 215, 1903; Meyr., Gen. Ins., p. 17, 1912; Meyr., Cat., p. 45, syn: borcella Meyr., Gen. Ins., p. 17, 1912; Meyr., Cat., p. 45.

Labrador.

guttea Haw. Lep. Brit., p. 531, 1828; Dietz, Trans. Am. Ent. Soc., XXXIII, p. 290, 1907; Meyr., Gen. Ins., p. 23, 1912; Meyr., Cat., p. 50.

?syn: solitariella Dietz, Trans. Am. Ent. 856., XXXIII, p. 290, pl. 4. fig. 1, 1907; Meyr., Gen. Ins., p. 23, 1912; Meyr., Cat., p. 50.

Foodplant: Malus.

Europe, U. S.

kalmiella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 291, pl. IV, fig. 3, 1907; Meyr., Gen. Ins., p. 23, 1912; Meyr., Cat., p. 51.

Foodplant: Kalmia angustifolia.

Pa., Conn.

preciosella Dietz, Trans. Am. Ent. Soc. Phil., XXXIII, p. 291, pl. IV, fig. 2, 1907; Meyr., Gen. Ins., p. 23, 1912; Meyr., Cat., p. 51.

Foodplant: Vaccinium corymbosum. Pa., Conn.

crataegifoliella Clemens, Proc. Acad. Nat. Sci. Phil., p. 8, 1850; Tin. No. Am., p. 94, 1872; Cham., Can. Ent., V, p. 48, 1873; Busck. Proc. Ent. Soc. Wash., V, p. 215, 1903; Dyar, Cat., No. 6388; Dietz, Trans. Am. Ent. Soc., XXXIII, p. 292, 1907; Braun, Ent. News., XX, p. 431, 1909; Meyr., Gen. ins., p. 24, 1912; Meyr., Cat., p. 52.

Foodplant: Cratacgus tomentosa. Atl. States

dubitella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 292, pl. IV, fig. 4, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.
Pa.

conspicuella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 293, pl. IV, fig. 5, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.

Foodplant: Betula nigra. Pa.

arbitrella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 293, pl. IV, fig. 6, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.

Foodplant: Vaccinium corymbosum.

Pa.

Circle Dietz Trans Am. Ent. Sec. XXXIII p. 206, pl. IX 5.7.8

vicinella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 296, pl. IV, fig. 8, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 53.

Foodplant: Betula flava. Pa.

strobivorella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 296, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 53.

Foodplant: Sorbus.

Pa.

arbutifoliella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 296, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 53.

Foodplant: Pyrus arbutifolia. Pa.

obliteratella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 297, pl. IV, fig. 10, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 53.
Foodplant: Betula nigra.

Pa.

Foodplant: Betula nigra.

inusitatumella Chambers (Braun), Can. Ent., V, p. 47, 1873; VIII, p. 19, 1876; Dyar, Cat., No. 6392; Dietz, Trans. Am. Ent. Soc., XXXIII, p. 289, 1907; Braun, Ent. News., XX, p. 431, 1909; Meyr.,

Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.

syn: inusitatella Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.

Focdplant: Crataegus mollis.

Ky., Ohio.

melanotella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 293, pl. IV. fig.

7, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.

Foodplant: Crataegus.

geminatella Packard, Guide Stud. Ins., p. 353, 1869; Chambers, Can.
Ent., III, p. 183, 1871; Dyar, Cat., No. 6387; Dietz, Trans. Am.
Ent. Soc., XXXIII, p. 295, 1907; Meyr., Gen. Ins., p. 24, 1912;

Meyr., Cat., p. 53.

syn: prunivorella Chambers, Can. Ent., V, p. 50, 1873; Cin. Quart.
Jn. Sei., H, p. 301–1875; Bull. Geol. Surv. Terr., HI, pp. 133, 141, 1877; psyche, 7H, p. 67, 1880; Wlsm., Trans. Am. Ent. Soc., X, p. 194, 1882; Dyar, Cat., No. 6378; Dietz, Trans. Am. Ent. Soc., XXXIII, p. 295, 1907; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 53.

Foodplants: Malus and "wild cherry." Mo., North Atl. States. quadripunctella Clemens (Dietz), Proc. Ent. Soc. Phil., I, p. 86, 1861; Tin. No. Am., p. 177, 1872; Dyar, Cat., No. 6395; Dietz, Trans. Am. Ent. Soc., XXXIII, p. 295, 1907; Meyr., Gen. 1ns., p. 24, 1912; Meyr., Cat., p. 53.

Foodplants: Pyrus arbutifolia and Malus.

2syn: albifasciella Dietz, Trans. Am. Ent. Soc., XXXIII, p. 295,
1907; Meyr., Cat., p. 53.

Pa.

innotata Wlsm., Proc. U. S. Nat. Mus., XXXIII, p. 224, 1907; Meyr.,Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.U. S.

trepidella Clemens, Proc. Acad. Nat. Sci., p. 7, 1860; Tin. No. Am., p. 94, 1872; Busek, Proc. Ent. Soc. Wash., V, p. 196, 1903; Dyar, Cat., No. 6394; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.
Pa.

festinella Clemens, Proc. Acad. Nat. Sci., Phil., p. 97, 1860; Tin. No. Am., p. 94, 1872; Busck, Proc. Ent. Soc. Wash., V. p. 196, 1903; Dyar, Cat., No. 6391; Meyr., Gen. Ins., p. 24, 1912; Meyr., Cat., p. 52.

Pa.

GRACILARIA Haworth.

Lep. Br., p. 527, 1828.

Type: Gracilaria syringella Fabricius. Coriscium Zeller, Isis, p. 210, 1839.

Type: Gracilaria cuculi pennellum Hübner.

minimella Ely, Inse. Inse. Mens., 111, p. 58, 1915.
 Conn.
 (†) sebastianella Busck, Proc. U. S. Nat. Mus., XXIII. p. 251, 1900;
 Dyar, Cat., No. 6384; Meyr., Gen. Ins., p. 16, 1912; Meyr., Cat., p. 44.

Foodplant: Sebastiana lucida.

Fla.

(†) burserella Busek, Proc. U. S. Nat. Mus., XXIII. p. 251, 1900; Dyar,
 Cat., No. 6383; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 58.
 Foodplant: Bursera gummijera.

flavimaculella Ely, Insc. Insc. Mens., HI, p. 57, 1915.

Conn.

cornusella Ely, Înse. Inse. Mens., III, p. 53, 1915.
Foodplants: Cornus stolonitera and C. alternitolia.

Conn., Md.

vacciniella Ely. Insc. Insc. Mens., III, p. 52, 1915.

Foodplant: Vaccinium.

Pa.

bimaculatella Ely, Insc. Insc. Mens., 111, p. 53, 1915.
Foodplant: Accer rubrum.
Atl. States.

burgessiella Zeller, Ver. zool-bot. Ges. Wien., XXIII, p. 307, 1873;
 Dyar, Cat., No. 6378; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 58; Ely. Insc. Mens., III, p. 51, 1915.

Foodplant: Cornus candidissima. Mass., Conn.

belfrageella Chambers, Can. Ent., VII, p. 92, 1875; Dyar, Cat., No. 6348; Meyr., Gen. Ins., p. 29, 1912; Braun, Ent. News., XXIII, p. 166, 1912; Meyr., Cat., p. 58.

syn; auxiterella Frey & Boll. Stett. ent. Zeit., XXXVII, p. 211. 1876; Dyar, Cat., No. 6379; Meyr., Gen. ins., p. 28, 1912; Meyr., Cat., p. 56.

Foodplant, Cornus. Tex., Atl. States.

blandella Clemens, Proc. Ent. Soc. Phil., 111, p. 505, 1861; Tin. No. Ann., p. 257, 1872; Cham., Can. Ent., V, pp. 13, 47, 1873; Dyar. Com., No. 6349; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 58.

syn: juglandivorella Chambers, Can. Ent., V, p. 15, 1873.

Foodplant: Juglans nigra. Tex., East States.

juglandiella Chambers, Can. Ent., IV, pp. 28, 88, 1872; V, pp. 15, 47, 1873; Dyar, Cat., No. 6359; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

syn: juglandisnigraella Chambers, Bull. Geol. Surv. Terr., IV. p. 149, 1878; Dyar., Cat., No. 6359; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

Foodplants: Juglans nigra.

East States.

ostryaella Chambers (Braun). Bull. Geol. Surv. Terr., IV, p. 121, 1878; Can. Ent., IX, p. 127, 1877; Braun, Ent. News., XXIII, p. 167, 1912; Ely. Insc. Mens., III, p. 61, 1915.

Foodplants: Ostrya; Carpinus. Atl. States.

violacella Clemens, Proc. Ac. Nat. Sci. Phil., p. 7, 1860; Tin. No. Am.,
p. 93, 1872; Cham., Can. Ent., IV, p. 26, 1872; V. p. 46, 1873; Cin.
Quart. Jn. Sci., I, p. 208, 1874; Zeller, Verh. zool-bot. Ges. Wien.,
XXIII, p. 108, 1873; Dyar, Cat., No. 6352; Meyr., Gen. Ins., p.
29, 1912; Meyr., Cat., p. 58; Busck, Proc. Ent. Soc. Wash., V, p.
196, 1903.

syn: desmodijoliella Clemens Proc. Ent. Soc. Phil., V, p. 145, 1865;
Tin. No. Am., p. 268, 1872; Frey & Boll, Stett. ent. Zeit., XXXVII,
p. 212, 1876; Dyar, Cat., No. 6352; Busek, Proc. Ent. Soc. Wash.,
V, p. 196, 1903; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 58.

Foodplant: Desmodium.

Mo., Atl. States.

(*) zachrysa Meyrick, Jn. Bomb. Nat. Hist. Soc., XVII, p. 983, 1907;
 Gen. Ins., p. 29, pl. fig. 4, 1912; Meyr., Cat., p. 58.
 syn: azalea Busck, Insc. Insc. Mens., III, p. 42, 1915.
 N. Y.

syn: azalea Busck, Inse. Insc. Mens., III, p. 42, 1915.

N. Y.
Foodplant: Azalea.

Cevion.

packardella Chambers, Can. Ent., IV, p. 27, 1872; IX, p. 194, 1877; Cin.
Quart. Jn. Sci., I, p. 200, 1874; Dyar, Cat., No. 6372; Meyr., Gen.
Ins., p. 29, 1912; Meyr., Cat., p. 58.

Foodplant: Acer saccharinum.

Atl. States.

syn: clegantella Frey & Boll, Stett. ent. Zeit., XXXIV, p. 202,
1873; Chambers, Cin. Quart. Jn. Sei., II, p. 227, 1875; Dyar, Cat.,
No. 6372; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 58.

syn: inornatella Chambers, Can. Ent., VIII, p. 31, 1876; XI, p. 119, 1879; Dyar, Cat., No. 6372; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 58.

coroniella Clemens, Proc. Ent. Soc. Phil., 1I, p. 421, 1864; V, p. 145, 1866; Tin. No. Am., p. 243, 1872; Wlsm., Trans. Am. Ent. Soc., X, p. 192, 1882; Dyar, Cat., No. 6351; Busek, Proc. Ent. Soc. Wash., V, p. 216, 1903; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 58.

Foodplant: Betula populifera. Pa., III., Md., Conn.

glutinella Ely, Inse. Insc. Mens., III, p. 55, 1915.

Foodplant: Alnus. Conn., Va.

superbifrontella Clemens, Proc. Ac. Nat. Sci. Phil., p. 5, 1861; Proc.

Ent. Soc. Phil., V, p. 145, 1865; Tin. No. Am., pp. 91, 269, 1872; Frey & Boll, Stett. ent. Zeit., XXXIV, p. 202, 1873; Cham., Cin. Quart. Jn. Sei., I. p. 200, 1874; II, p. 226, 1875; Dyar, Cat., No. 6372; Busek, Proc. Ent. Soc. Wash., V, p. 194, 1903; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 58.

Foodplant: Hamamelis virginiana. Atl. States.

negundella Chambers, Can. Ent., VIII, p. 18, 1876; Bull. Geol. Surv. Terr., III, p. 132, 1877; Psyche, III, p. 66, 1880; Dyar, Cat., No. 6360; Meyr., Gen. Ins., p. 28, 1912; Braun, Ent. News., XXIII, p. 169, 1912; Meyr., Cat., p. 56.

Foodplant: Negundo aceroides. Col., Atl. States.

- stigmatella Fabricius, Sp. Ins., II, p. 295, 1781; Chambers, Can. Ent.,
 NI, pp. 74, 119, 1879; XII, p. 24, 1880; Busck, Proc. U. S. Nat.
 Mus., XXVII, p. 771, 1904; Dyar, Cat., No. 6362; Meyr., Gen.
 Ins., p. 29, 1912; Meyr., Cat., p. 59.
 - Foodplants: Salix and Populus. Europe, Transcaspian, U. S. syn: purpuriella Chambers, Can. Ent., IV. p. 27, 1872; V, p. 46, 1873; TX, pp. 126, 194, 1877; XI, p. 74, 1879; Dyar, Cat., No. 6362; Busek, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 59.
 - (*) syn: consimilella Frey & Boll, Stett. ent. Zeit., XXXVII, p. 210, 1876; Dyar, Cat., No. 6380; Meyr., Gen. Ins., p. 29, 1912; Meyr., Cat., p. 59.
- (*) populiella Chambers, Cin. Quart. Jn. Sei., II, p. 301, 1875; Bull. Geol. Surv. Terr., III, p. 132, 1877; Dyar, Cat., No. 6373; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

Foodplant: Populus. Col.

- (*) palustriella Braun, Ent. News., XXI, p. 178, 1910; Meyr., Cat., p. 56. Foodplant: Salix, Calif.
- rhoifoliella Chambers, Can. Ent., VIII, p. 31, 1876; Dyar, Cat., No. 6363; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

Foodplant: Rhus. Kan., East. States, So. States.

sassafrasella Chambers, Can. Ent., VIII, p. 33, 1876; Dyar, Cat., No. 6367; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

Foodplant: Sassafras. Atl. States.

- (*) obscuripennella Frey & Boll, Stett, ent. Zeit., XXXVII, p. 209, 1876; Dyar, Cat., No. 6382; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 58.
 Tex.
- acerifoliella Chambers, Cin. Quart. Jn. Sci., II, p. 299, 1875; Bull. Geol.
 Surv. Terr., III. p. 132, 1877; Dyar, Cat., No. 6342; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

Foodplant: Acer. Col.

atmosella Zeller, Verh. zool-hot. Ges. Wien., XXIII, p. 309, 1873; Dyar. Cat., No. 6346; Meyr., Gen. Ins., p. 27, 1912; Meyr., Cat., p. 55.

Tex., Atl. States.

quercinigrella Ely, Inse. Inse. Mens., III, p. 60, 1915.

Foodplant: Quercus.

Conn.

(*) reticulata Braun, Ent. News. ,XXI. p. 177, 1910. Foodplant: Quercus agrolia.

Calif.

flavella Ely, Inse. Insc. Mens., III, p. 56, 1915.

Foodplant: Myrica cerijera.

Conn.

alnivorella Chambers, Cin. Quart. Jn. Sci., II, p. 299, 1875; Bull. Geol.
Surv. Terr., III, p. 132, 1877; Dyar, Cat., No. 6344; Busck, Proc.
U. S. Nat. Mus., XXVII, p. 771, 1904; Meyr., Gen. Ins., p. 28, 1912;
Meyr., Cat., p. 57.

Foodplant: Alnus.

Can. West. States.

syn: alnicolella Chambers, Cin. Quart. Jn. Sci., II, p. 299, 1875; Bull.
Geol. Surv. Terr., III, p. 132, 1877; Dyar, Cat., No. 6343; Busek.
Proc. U. S. Nat. Mus., XXVII, p. 771, 1904; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

syn: pulchella Chambers, Can. Ent., VII, p. 186, 1875; Dyar, Cat., No. 6377; Busck, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

syn: sanguinella Beutenmüller, Ent. Am., IV, p. 30, 1888; Dyar, Cat., No. 6368; Busck, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

syn: nigristrigella Beutenmüller, Ent. Am., IV, p. 30, 1888; Dyar.
Cat., No. 6361; Busck, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904;
Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

syn: ruptostrigella Beutemnüller, Ent. Am., IV, p. 30, 1888; Dyar.
 Cat., No. 6361; Busck, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904;
 Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

syn: shastaella Beutenmüller, Ent. Am., IV, p. 30, 1888; Dyar, Cat.,
No. 6369; Busck, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904; Meyr.,
Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

syn: juscoochrella Beutenmüller, Ent. Am., V. p. 10, 1889; Dyar,
 Cat., No. 6358; Busck, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904;
 Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 57.

(*) stricteHa Walker, Cat. Brit. Mus., XXIX, p. 591, 1864; Dyar, Cat., No. 6386; Meyr., Gen. Ins., p. 27, 1912; Meyr., Cat., p. 56.

syn: adaptella Walker, Cat. Brit. Mus., XXIX, p. 590, 1864; Dyar Cat., No. 5778; Meyr., Gen. Ins., p. 27, 1912; Meyr., Cat., p. 56.

Can.

(*) sauzalitoella Chambers, Can. Ent., VIII, p. 32, 1876; Dyar, Cat., No. 6366; Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 53. Calif. syn: sauzalitella Meyr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 56.

murtfeldtella Busek, Proc. U. S. Nat. Mus., XXVII, p. 771, 1904; Movr., Gen. Ins., p. 28, 1912; Meyr., Cat., p. 58. D. G. Mo., Wash., serotinella Ely, Ent. News., XXI, p. 57, 1910; Meyr., Cat., p. 49.

Foodplant: Prunus scrotina. N. Atl. States.

paradoxum Frey & Boll, Stett. ent. Zeit., XXXIV, p. 205, 1873; XXXVII, p. 212, 1876; Cham., Cin. Quart. Jn. Sci., I, p. 200, 1874; Dyar, Cat., No. 6397. Atl. States.

syn: paradoxa Meyr., Gen. Ins., p. 21, 1912; Meyr., Cat., p. 49.

cuculipennellum Hübner, Ges. eur. Schmett., VIII, Tin., VI. Al. B. F. 2, 1831; Fernald, Can. Ent., XXV, 96, 1893; Dyar, Cat., No. 6401; Kellogg, Am. Insects, p. 378, 1905; Braun, Can. Ent., XLIV, p. 160, 1912.

Foodplant: Ligustrum. Europe. syn: euculipennella Meyr., Gen. Ins., p. 26, 1912; Meyr., Cat., p. 55. ?syn: fraxinella Ely, Inse. Inse. Mens., p. 58, 1915.

Foodplant: Fraxinus. N. Y., Ohio, Conn.

Not recognized from descriptions.

- (*) aceriella Chambers, Jn. Cin. Soc. Nat. Hist., III, p. 295, 1880; Dyar.
 Cat. No. 6341; Meyr., Gen. Ins., p. 27, 1912; Meyr., Cat., p. 56.
 Foodplant: Acer.

 Mass.
- (*) behrensella Chambers, Can. Ent., VIII, p. 32, 1876; Dyar, Cat., No. 6347; Meyr., Gen. Ins., p. 27, 1912; Meyr., Cat., p. 55. Cal.
- (*) ribesella Chambers, Bull. Geol. Surv. Terr., III, p. 132, 1877; Dyar, Cat., No. 6376; Larva only described.

Foodplant: Ribes.

Col.

SCHISTOCERCA TARTARICA TAKEN AT SEA.

BY L. O. HOWARD

A specimen of Schistocerca tartarica (determined by Caudell) was received from Professor Marvin, the Chief of the Weather Bureau, to whom it had been sent by Captain B. Morthensen of the Norwegian bark Robert Scrafton. It seems that Captain Morthensen is one of the coöperative marine observers of the Weather Bureau, and he noted in his report that on October 7, 1916, a lot of these grasshoppers came aboard in lively condition. At that time the vessel was 1200 nautical miles from the African coast, latitude 20° 57′ N., longitude 39° 28′ W. The author has been informed by Mr. Caudell that this locust occurs in southern Europe, Africa, in Ceylon, and also in Central America and northern South America, and that there are records of its prolonged flight over the sea. It is worth while, however, to place this well authenticated case on record.

COLOR VARIATION IN PUPAE OF TERIAS NICIPPE CRAMER.

By Geo. G. Ainslie,

United States Entomological Laboratory, Knoxville, Tenn.

In a note in the first volume of Entomological News, page 129, Dr. H. Skinner mentions the variation in the color of the pupae of *Terias nicippe* Cramer and states that he found both green and black pupae. Scudder, in his "Butterflies of the Eastern United States," makes a similar observation, some of his specimens being mottled. All those reared disclosed normal adults.

A further observation was made by the writer at Hartsville, Tennessee, in August, 1913. Larvae of this species were found feeding on plants of Cassia tora and C. marylandica. Supposing them to be those of Eurymus eurytheme which they closely resemble, a number were collected and placed in cages on alfalfa, clover and various other plants. The immature larvae died without feeding, the rest pupated suspended in their normal position on the various plants with which they were confined. The pupae thus obtained and an additional series taken in the field at the time of the original collection present an interesting range in coloration. Pupae formed on the leafy parts of the normal food plants are green. In this series those formed on the caged plants of alfalfa, clover, etc., were also green but of a shade agreeing exactly with that of the particular plant on which they were found. One pupa found in the field suspended close to and partly from one of the yellow flowers of Cassia tora was of a uniform vellow color, matching the flower. From some plants growing close to an old rusty wire fence some larvae had migrated to the fence and had pupated suspended from the wires. These pupae varied from Brown to black in color, in each case agreeing closely with the color of the wire from which it hung. All the pupae developed into normally colored butterflies.

Three Hundred and First Meeting, February 8, 1917.

The 301st regular meeting of the Society was entertained by Mr. C. L. Marlatt at the Saengerbund Hall, February 8, 1917. There were present Messrs. Back, Baker, Barber, Borden, Böving, Busck, Cole, Cary, Craighead, Crawford, Cushman, Dietz, Ely, Fink, Fisher, Garman, Gill, Greene, Heinrich, Hyslop, Isely,

Jennings, Kotinsky, Middleton, Miller, Paine, Pierce, Rohwer, Sanford, Sasseer, Schwarz, Snyder, Speare, Webb, White, members, and A. J. Flebert, R. M. Foutz, W. V. King, Albert Lepper, H. F. Loomis, H. S. McConnell, C. J. Pierson, and Delmar Webb, visitors.

At the end of the regular program, the meeting was brought to a delightful close by the presentation to the Saengerbund by the Entomological Society of a nearly life-sized portrait of Mr. E. A. Schwarz, honorary president of our Society and for many years a member of the Saengerbund. President Ely made the presentation address in which he spoke feelingly of Mr. Schwarz's long connection with the Society and the high place he holds in the esteem of his fellow-members. At the close of his remarks the president read a letter from Dr. L. O. Howard setting forth his disappointment at not being able to be present to take part in the presentation and expressing in fitting terms his admiration and affection for Mr. Schwarz.

The gift was accepted, on behalf of the Saengerbund, by its president, Mr. Albert Lepper, who expressed the gratification and appreciation of his Society and in a few appropriate remarks told of the esteem in which Mr. Schwarz is held by his associates in the Saengerbund.

Mr. Schwarz expressed his appreciation of this demonstration of affection and regard on the part of his fellow society-members and with characteristic modesty stated: "It is more than I deserve. Whatever benefit I may have been to the Society or whatever help I may have been, is sufficient reward in itself."

The following program was presented:

TWO NEW CHALCIDS FROM THE SEEDS OF AMELANCHIER.¹

By R. A. Cushman,

Entomological Assistant, Bureau of Entomology.

No chalcid has heretofore been recorded as breeding in the seeds of any species of the genus Amelanchier. Discovery that there is such an insect developing in the seeds of the shad bush (A. cana-

¹ Published by permission of the Secretary of Agriculture.

densis) was first made by the writer on July 1, 1914, when a small package of the berries was received at North East, Pa., from Mr. Fred E. Brooks of the Bureau of Entomology, stationed at French Creek, W. Va. A few of the seeds were found to contain full-grown chalcid larvae. Closer examination of these larvae a few days later disclosed the fact that they were apparently of two species, the mandibles in one form being dentate and in the other edentate.

On July 18, of the same year, larvae were found in the seeds

of berries collected by the writer near North East, Pa.

Parts of both of these lots of material were placed in breeding jars and kept until the spring of 1915, but nothing was reared.

No further information concerning the chalcids was obtained until June 21, 1915, when one female of each of two species of Syntomaspis were beaten from a shad bush bearing nearly ripe fruit at North East. These were placed in cages on the tree, and one was later observed to attempt oviposition in a nearly ripe berry. No activity of this sort was observed for the other species.

In the summer of 1915 more berries were collected at North East and more received from Mr. Brooks from both French Creek and Pickens, W. Va. All of these lots were found by examination to contain some infested seeds. The bulk of each lot

was placed in a jar for rearing.

On May 26, 1916, all the seeds in the French Creek lot were examined. Nearly all of the living insects found were in the pupal stage, most of them nearly ready for transformation, but a few were still in the larval stage. All of the latter had the mandibles acute and toothless. All of these stages were removed from the seeds, placed in a watch glass, and covered. on May 28, three female specimens of a species of Meg istigmus were reared. On the same date three females and one male of the same species emerged from the berries from Pickens, W. Va. On June 1, emergence ceased and the contents of the Pickens and North East cages were examined. This resulted in the finding of many dead adults, all Megastigmus. Up to this time there has been recorded from the Pickens lot 17 females and 3 males. The dead in this lot totaled 28 females and 1 male. Although the first specimens seen were found on May 28, the finding of so many dead specimens so soon after that date would seem to indicate that emergence probably began some time earlier. The balance of the immature stages from the French Creek lot, both larvae and pupae, were put in alcohol. There was no further rearing from the North East berries, but on June 10 emergence from the Pickens lot began again. This time,

however, the insects reared were a *Syntomaspis* of the same species as the one observed to attempt oviposition in the previous season. Before this time, on May 31, one male of the species had appeared in the Pickens material. Emergence of

Suntomaspis continued until June 16.

The result of the rearings led to the suspicion that the *Syntomaspis* was parasitic on the *Megastigmus*, and support of this idea was secured when examination of a seed from which a *Syntomaspis* had emerged disclosed an exuvium of a full-grown larva with edentate mandibles and a dead and shrivelled larva with dentate mandibles. Whether this is the normal habit of *Syntomaspis* can not be stated definitely, but the much later emergence of the *Syntomaspis*, together with its comparative rarity and the condition of the seeds of the berries at the time the adults are active all indicate that such is the ease.

The finding of the traces of both species in the single seed also fixed the relation between the two species of adults, the larva with dentate mandibles being that of *Megastigmus* and the one with edentate mandibles that of *Syntomaspis*. Further proof of the identity of the larvae was obtained on July 9, when berries exposed to the attack of *Megastigmus* in cages and protected against subsequent attack were found to contain larvae with dentate mandibiles.

The two species of insects concerned, both new to science, are described herewith.

Megastigmus amelanchieris n. sp.

In Crosby's table to North American species of the genus! runs to brevicaudis Ratzeburg, the ovipositor being barely as long as the abdomen and the stigmal club broadly oval (Plate I, fig. f). It is easily distinguishable from that species by the color of the pronotum, which is black above and yellow at the sides, and that portion of the scutellum beyond the groove being smooth and polished, while in brevicaudis it is finely aciculate.

Female.—Length 2.6 mm., abdomen 1 mm., ovipositor 1 mm. Head viewed from in front slightly wider than long, viewed from above with the temples as broad as the eyes and nearly angulately rounded; eyes slightly divergent below; elypeus very short and broadly emarginate at apex; malar space about as long as basal width of mandibles; sides of face obliquely striate with a few large, setigerous punctures above the antennal fossae; vertex, frons, and superior orbits transversely striate, with a few large, shallow pits on orbits and vertex; anterior occllus somewhat larger than lateral occili; occil-ocular and interoccilar lines equal

¹ Crosby, C. P., Ann. Ent. Soc. Am., Vol. VI, 1913, p. 156.

and slightly more than half as long as postocellar line; pronotum transversely rugose above, obliquely striate and with scattered pits laterally; mesonotum transversely, arcuately striate, the striae strongest on mesoscutum and weakest on the scutellum, the latter being smooth beyond the crenulate transverse furrow; mesopleurum coarsely, granularly opaque above the suture, vertically striate below; propodeum coarsely roughened, with some oblique rugosity basally; stigmal club broadly oval; basal vein weak but distinctly indicated; abdomen about as high as long, polished; ovipositor as long as abdomen, strongly upcurved.

Black, with face, mouth, orbits except a broad interruption at top of eyes, in which is a brownish spot, scape and pedicel below, sides of pronotum, legs, except hind coxae and base of middle coxae, and tegulae lemon yellow; sides of abdomen more or less brown stained.

Male.—Length 2.3 mm., abdomen 1 mm. Very like female, with seulpture throughout weaker, abdomen very strongly compressed, first tergite in side view much longer than high; stigmal club considerably broader; antennae yellow below throughout.

Host.—Seeds of Amelanchier canadensis.

Type locality.—Pickens, W. Va.

Other localities.—French Creek, W. Va., and North East, Pa.

Type.—Cat. No. 20964 U. S. N. M.

Described from a considerable series of specimens, including two males, from the three localities, those from Pickens, W. Va., under Quaintance No. 10930, those from French Creek, W. Va., under Quaintance No. 16929, and those from North East, Pa., under Quaintance No. 11014. The two lots of breeding material from West Virginia were collected by Mr. Fred E. Brooks of the Bureau of Entomology, but all specimens were reared by the author at North East, Pa.

The principal variations are in size, 2-2.6 mm. in the female, and in the extent of the orbital maculation, some of the specimens having the yellow color much less extensive above and with a nearly complete interruption in the cheek. Some of the specimens, especially the smaller ones, have the sculpture less strong throughout.

Syntomaspis amelanchieris n. sp.

Female.—Length 2.6 mm., abdomen 1.2 mm., ovipositor 1.5 mm. Head in front view round, slightly wider than long, viewed from above strongly transverse, the temple sharply, roundly sloping, head shagreened, the sculpture finer and fainter on face; width of face equal to height of eyes, the latter parallel within; clypeus polished at apex and with a median tooth; malar space subequal to basal width of mandible; interocellar line half as long as postocellar and slightly shorter than occllocular; middle antennal joints wider than long. Thorax above shagreened with scat-

tered punctures, pronotum transversely striate; thorax laterally shagreened, mesopleurum above pleural suture polished; propodeum shagreened, subpolished medially; coxac obscurely shagreened; abdomen polished, faintly reticulate laterally; ovipositor slightly longer than abdomen.

Metallic green with bronzy reflections, this color extending to the coxae and femora; hind tibiae dark brown, legs otherwise yellow; scape yellow, antennae otherwise blackish with purplish bronze luster.

Male.—Length 2.3 mm. In sculpture and color very similar to female.

Type locality.—Pickens, W. Va. Other locality.—North East, Pa. Type.—Cat. No. 20968 U. S. N. M.

Described from five females and one male reared by the author May 31 to June 16, 1916, under Quaintance No. 11013, from seeds of Amelanchier canadensis in company with Megastigmus amelanchieris Cush. The material collected at the type locality by Mr. Fred E. Brooks, and one female captured by the author on the same plant at North East, Pa., June 21, 1915, and later observed to attempt oviposition in an Amelanchier berry.

The specimens show very little variation in size or sculpture. Paratypes d and e have distinct purplish reflections at the base

of the abdomen.

HABITS OF MEGASTIGMUS.

At the time when emergence of *Megastigmus* was in progress the *Amelanchier* berries were from three-sixteenths to one-fourth inch in diameter, and the seed contents semifluid to gelatinous.

Oviposition takes place in late May and early June at the latitude of North East. In oviposition the female inserts her ovipositor through the side of the berry. The egg has not been found, but, as is the case in all seed-chalcids, the eggs of which are known, it is undoubtedly deposited within the tissue of the seed. The larva consumes the entire seed contents and attains full growth by shortly after the first of July. By this time the fruit is ripening and falling to the ground, and the seed coat has become hardened and brown. Infested seeds are less plump and more irregular in form than sound seeds and will float on water, while sound seeds will sink. Within the seed the larva contracts and becomes less strongly curved and remains in this condition until the following spring, when it pupates and a few days later emerges as the adult insect. Thus in the development of a single generation very nearly the entire year is consumed.

Thus far the only known host of this species is Amelanchier canadensis and the only localities French Creek and Pickens, W. Va., and North East, Pa. Through the kindness of Mr. Lewis

H. Weld of the faculty of Evanston Academy, Evanston, Ill., a large lot of berries of the 1916 crop were received from Evanston, but these were apparently uninfested. A large lot of the berries of the purple fruited *Amelanchier oligocarpa* were also received from Mr. Brooks, who had collected them in the mountains of Tucker Co., W. Va. No infestation was found in this lot.

HABITS OF SYNTOMASPIS.

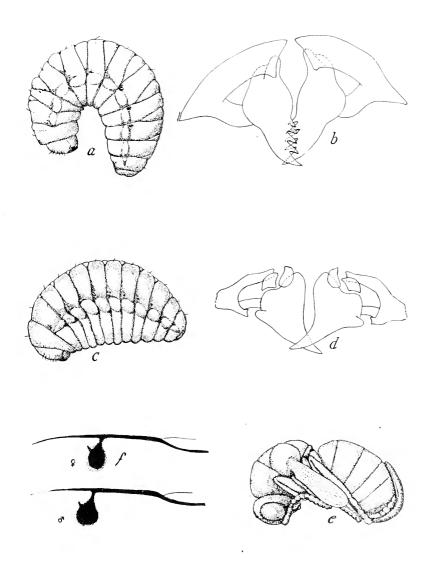
The adults of *Syntomaspis* emerge in the spring from two to three weeks later than *Megastigmus*. At this time the berries are nearly full grown, and the seeds are beginning to harden. Oviposition takes place during the latter part of June, and the insect passes the winter as a somewhat contracted larva within the seed.

LARVAE OF MEGASTIGMUS AND SYNTOMASPIS.

The larvae of the two species (Plate X, fig. a Megastigmus and fig. c Syntomaspis) are superficially very similar. Both are stout, white, footless grubs about 2.5 to 3 mm. long, tapering toward each end and curved toward the venter, that of Megastigmus being much the more strongly so. Both have spiracles on the anterior edges of the mesothoracic and metathoracic and first seven abdominal segments. The most striking difference between the larvae is found in the mandibles. As stated above those of Syntomaspis are edentate while those of Megastigmus have a series of strong teeth on the inner margin. The normal number of teeth is four, but occasionally one mandible in a pair has but three teeth, sometimes regularly spaced and sometimes as though there were four with the second tooth missing. mandibles articulate with chitinous structures on the inner surface of the integument. In Megastigmus these are broad and strongly angulate at the outer superior and inferior angles. Syntomaspis they are narrow and nearly semicircular without strong angulations. In making slide mounts of these structures it is difficult to maintain the normal position and relations, and the accompanying figures (Plate I, figs, b and d) drawn from slide mounts do not show them as they actually appear from a surface view of the face of the larva.

PUPA OF MEGASTIGMUS.

The pupa of the *Syntomaspis* has never been seen. That of the female of *Megastigmus* (Plate X, fig. e) is short with the head bent downwards and with the legs, antennae, and wing pads folded along the sides and venter in the manner usual with hymenopterous pupae. The ovipositor is curved upward close to the back



and reaches nearly half way over the back of the abdomen. The male pupa is more slender and the abdomen is much narrower.

PLATE X.

Megastigmus amelanchieris Cush.

a.—Full-grown feeding larva.

b.—Mandibles and supporting ridges of same.

e.—Pupa.

f.—Stigmal clubs.

Syntomaspis amelanchicris Cush.

c.—Hibernating larva.

d.—Mandibles and supporting ridges of same.

PHOTOMICROGRAPHY AND ITS APPLICATION TO THE STUDY OF THE COCCIDAE.

By E. R. Sasscer.¹

In the discussion of this paper Mr. Schwarz inquired as to the best method of mounting coccidae for photomicrographing. Mr. Schwarz stated that glycerin mounts gave the best results, but that since most of the material that he had to examine is mounted in balsam he preferred that all be thus mounted. Mr. Baker suggested that for purposes of reproduction the photomicrographs should be retouched in order to bring out the important characters. To this Mr. Sasseer objected on the ground that this might lead to the overlooking by others of the characters thus intensified through their expecting to find them as conspicuous in the specimen as in the published figure. The paper was further briefly discussed by Messrs. Kotinsky, Ely, and Paine.

NOTES ON TWO SPECIES OF ACROBASIS, ESPECIALLY INJURIOUS TO PECANS.

By J. B. Gill.¹

¹ Withdrawn from publication.

ORYSSUS IS PARASITIC.

By H. E. Burke.

Specialist in Forest Entomology.1

So far as can be determined, the larval habits of the family Oryssidae have never been published. Harrington (Trans. Roy. Soc., Canada, Sect. IV. p. 151, 1893) says that "It has been suggested that they are of a parasitic habit, and the actions of the insects when searching for a place to oviposit very much resemble those of species well known to be parasitic." Rohwer (Proc. U. S. Nat. Mus., Vol. 43, p. 156, 1912) refers to an observation by Dr. A. D. Hopkins which indicates parasitism. He collected a pupa in an old mine of a Cerambycid in the dead wood of a living Douglas spruce (Pseudotsuga taxifolia) at Port Angeles, Washington, on May 15, 1899. A male was reared from this and named Oryssus hopkinsi Rohwer.

During the past two years a number of observations have been made by the various men attached to the Pacific Slope Forest Insect Station which definitely prove that *Oryssus* is parasitic on several species of the genus *Buprestis* and probably also on other

Buprestidae.

The first of these observations was made by the writer at Placerville, Calif, on March 21, 1914. A parasitic larva was found in a cell in the outer wood of an old scar on one side of the trunk of a healthy Douglas spruce near a young adult and a large larva of Buprestis aurulenta Linn. The parasitic larva was then supposed to be an Ichneumonial parasite of the Buprestis.

On September 17, 1915, Entomological Ranger J. D. Riggs collected at Bray, Calif., two larvae in an old aspen (*Populus tremuloides*) log. One was in the pupal cell with the fragments of a beetle (*Buprestis confluens* Say) and the other was attacking a larva of this same *Buprestis*. This latter specimen of parasitic larva pupated on March 9, 1916, and transformed to a female

adult Orussus occidentalis Cresson on March 29, 1916.

While collecting in some old weather beaten yellow pine (*Pinus pondcrosa*) logs near Placerville, Calif., on November 2, 1915, Entomological Ranger F. B. Herbert and the writer found a number of naked larvae, which we took to be *Ichneumonid* larvae, in the pupal cells of *Buprestis lacviventris* with the remains of the larvae of that species. On March 17, 1916, three of these pupated. One of these transformed to an adult *Oryssus occidentalis* on April 6, one on April 8, and one was preserved as a specimen.

⁴ Branch of Forest Insects, Bureau of Entomology, U. S. Department of Agriculture.

One larva pupated on March 18 and transformed to an adult April 8, and another pupated on March 22, and transformed on April 15.

On April 4, 1916, another examination of these logs was made. Mr. Herbert found an *Oryssus* pupa in what appeared to be the pupal cell of the Buprestid *Chrysophana placida*. At the same time the writer found a large *Oryssus* pupa in the pupal cell of *Buprestis laeviventris*. This transformed to a large female on

April 19.

At the last examination of the logs on May 27, Mr. Herbert "noticed an Oryssus female crawling over the same log from which we had obtained specimens of Oryssus Buprestis laeviventris, Buprestis aurulenta, Chrysophana placida, and Leptura She was examining the log very carefully, sweeping her antennae across the surface of the wood at every step. systematically covered most of the log, going the length of it three different times and covering certain areas 6 or 8 different times. After thirty-five minutes she apparently found a spot to her liking, which she covered several times. She finally placed her body at an angle of 15 to 20 degrees with the surface of the wood, with the abdomen against the wood, and began boring with the ovipositor. After $4\frac{1}{2}$ minutes she pulled the ovipositor out and began examining the log again when she was captured. the boring her body and antennae quivered all the while." spot on the log where she had bored was marked and examined. The hole made by the ovipositor was followed for $\frac{3}{4}$ of an inch until lost in the boring dust of a Buprestis larval mine.

Besides the records which point to the parasitic nature of Oryssus oecidentalis the following records have been made: by the writer—June 23 to July 7, 1906, four males and four females, at Summerdale, Calif., crawling on a weather beaten white fir (Abies concolor) log at an old mill; May 31, 1912, a female near Yreka, Calif., crawling over the trunk of a yellow pine (Pinus ponderosa) peeled during March, 1912, in the control work against the western pine beetle (Dendroctonus brevieomis); July 17, 1915, an adult male and female at Fallen Leaf, Calif., crawling up and down an old dead white fir (Abies eoneolor) stub; August 4, 1915, near Vade, Calif., a female crawling on the trunk of a solid, weather beaten, dead lodgepole pine (Pinus contorta), which was infested with Buprestis aurulenta larvae. By Entomological Ranger J. J. Sullivan—February 4, 1914, at Placerville, Calif., a larva from the outer wood of a dead digger pine (Pinus sabiniana) stump, which pupated on March 1 and transformed to an adult female on March 20; April 3, 1915, at Placerville, a pupa from the outer wood of a rotten sugar pine (Pinus lambertiana) stump which was a live female in the rearing vial on June 8. By Entomological Ranger F. B. Herbert—July 7, 1915, a female flying in the forest at the Pyramid Ranger Station, Calif; July 17, 1915, at Fallen Leaf, Calif., a female crawling on a dead white fir (Abies concolor); and May 5, 1916, at Placerville, Calif., a female on the stump of a yellow pine (Pinus ponderosa) treated in February, 1915, in the control work against the western pine beetle (Dendroctonus brevicomis).

Probably the most interesting point connected with the life history of *Oryssus* is what becomes of the long external ovipositor of the pupa upon transformation to the adult. The actual transformation was not observed so this is a point to be determined by future study. Another point to be determined is the exact length of the life cycle. The larvae of the genus *Buprestis* upon which the *Oryssus* is parasitic live for several years in the wood of the host plant. So far the *Oryssus* larvae have been found only with the large larvae of the *Buprestis*. Whether they are internal feeders when small in the small larvae of the *Buprestis* or whether they attack only the large larvae are points for future determination.

The specimens upon which these observations were made will be turned over to Mr. S. A. Rohwer for taxonomic study. As the larvae appear quite different from the typical horntail (Siricoidea) larva and the habits are quite different, the systematic position of Oryssus in the classification of the Hymenoptera may be changed.

IDIOGASTRA, A NEW SUBORDER OF HYMENOPTERA WITH NOTES ON THE IMMATURE STAGES OF ORYSSUS.

By S. A. Rohwer, Specialist in Forest Hymenoptera, and R. A. Cushman, Entomological Assistant.

Bureau of Entomology, Washington, D. C.

The summary by Rohwer of the literature dealing with the habits of the oryssoids published in 1912 (Proc. U. S. Nat. Mus., vol. 43, p. 141), shows the conflicting suppositions explaining the habits of the members of this interesting group. The importance of the discovery of the larva of *Oryssus occidentalis* and its habits by Mr. H. E. Burke are very manifest and have called forth the remarks on the position of the group offered below.

While the authors do not believe that the biology or any characters especially developed by unusual habits should be made the primary reason for systematic groups we do believe that biology offers a good index to affinities and gives valuable suggestions as to

the use of stable body characters. It is also possible that unusual habits may be the cause for the development of unusual characters which may be very valuable taxonomically, but may not necessarily express the true relationships.

In raising the oryssoids to subordinal rank we have only expressed in a taxonomic way the unusual, valuable, and striking differences which exist between them and the Chalastogastra and we believe that the parasitic habit of the larva indicates that these characters are of subordinal value.

As early as 1829 Macleay suggested that the sawflies could constitute a separate order and proposed the name Bomboptera and now in 1916 Crampton (Ent. News, vol. 27, p. 303) without definitely limiting or giving any defining characters and for apparently no other than theoretical reasons says: "The Hymenopterous insects should be divided into two orders, the *Prohymenoptera* or Tenthrenid group, and the *Hymenoptera* proper." We can see no real advantage in dividing the order Hymenoptera, as usually defined, into two orders and we believe that the group, as usually treated, is a homogeneous unit for which ordinal division is unnecessary and undesirable. The subordinal group Idiogastra is in itself sufficient reason to discard the ordinal names Bomboptera and Prohymenoptera.

Larva of Oryssus occidentalis.

(Description drawn from alcoholic specimens.)

The larva is white, subcylindrical, about one-third as thick as long, tapering slightly at each end, and somewhat flattened dorso-ventrally The caudal extremity is slightly upcurved. The constriction between the head and thorax is rather weak. The head is very short antero-posteriorly and less than half as broad as the greatest diameter of the body. The antennae are tubercle-like and set at the summits of rounded elevations. The mouth-parts are very simple, the labrum, labium, and maxillae being merely fleshy lobes, the last not divided into the usual parts. On each side of the middle of the labrum and near the apex is an irregular group of minute sensory papillae. The labial and maxillary palpi are apparently not at all developed, but on the surface of the labium are a few short, stout setae and on the maxillae in a brownish area a few sensory papillae. The mandibles are heavily chitinized, curved, narrow, and tridentate at apex, the outside teeth equal and shorter than the median, broad at base and articulating internally with heavily chitinized points at the dorsal and ventral angles. The ventral articulation extends, weakly chitinized, along the suture between the epigranium and the soft ventral surface of the head. There is also a weakly chitinized ridge internally along the lower edge of the maxilla. On plate XII, figure 1, these chitinized ridges and the concealed portions of the mandibles are indicated by stippling.

Each thoracic and abdominal segment has dorsally at each side of the middle a low, transverse elevation surmounted by a transverse row of four or five short, stout, backward pointing spines. The mesothoracic, metathoracic, and first eight abdominal segments bear spiracles. Those of the mesothorax are situated in the intersegmental skin between the prothorax and mesothorax, apparently on the prothorax. Those of the metathorax are rudimentary and nonfunctional, and are, like those of the abdominal segments, situated near the anterior margin of the segment. The larva is legless, but the positions of the legs are indicated by chitinized disks.

Pupa of Oryssus occidentalis.

(Descriptions drawn from alcoholic specimens.)

Female.—Uncolored. In general the head, thorax and base of abdomen resemble the adult but the most striking difference occurs in the ovipositor and sheath which is curved up over the back and reaches the anterior margin of the head. Head much as in adult, even to the definition of the tubercles around the ocelli; the pupal skin enclosing the antennae obscures the joints but from what can be seen the ninth is not abnormally swollen and is connected with the tenth by its entire apical width; tarsi jointed as in adult; thorax much the same as to the sutures (these not well defined in adult); the straight suture separating the scutum and scutellum, which is strong in the adult, is weak in the pupa and the suture dividing the scutellum, which is weak in the adult, is strong in the pupa. Abdomen with seven well defined, visible tergites, the first not divided, the eighth tergite smaller than the seventh; ninth tergite represented dorsally as a narrow plate but produced anteriorly and ventrally; tenth tergite not clearly defined but probably represented at the apical end of the ninth as a transverse plate; second to eighth tergites, inclusive, with a series of fleshy protuberances surmounted by transverse rows of spines near apical lateral margin. First sternite concealed, the six following well defined, the second nearly covered by hind coxac, the remaining uncovered and visible; eighth and ninth sternites not visible except as represented by their appendages; tenth sternite not visible externally; pleural fold fleshy. The external portion of the ovipositor as described above; internally it extends forward into the mesothorax where it makes a simple loop.

The following are the most striking differences between the female pupa and adult.

- 1. Ninth antennal joint normal.
- 2. Scutum without lateral sutures.
- 3. Accessory suture of scutellum strong.
- 4. Suture between scutum and scutellum weak.
- 5. Tergites with fleshy protuberances.
- 6. Apical tergites and sternites different.
- 7. Ovipositor curled up over the back.

Male.—A pupal envelop which contains a nearly fully colored adult does not show, without dissection anything especially extraordinary. The pupal envelop shows the thoracic structure of the female pupa, spines on apical margins of tergites two to eight inclusive; and sternites two to six inclusive.

SUBORDER IDIOGASTRA, NEW SUBORDER.

This suborder is proposed for the superfamily Oryssoidea as defined by Rohwer in 1911 (Proc. Ent. Soc. Wash., vol. 12, no. 4, p. 217) and 1912 (Proc. U. S. Nat. Mus., vol. 43, p. 146).

As a systematic division the suborder Idiogastra has long been recognized but it is only comparatively recently (MacGillivray, 1906, Enslin, 1911, Rohwer, 1911, 1912) that it has been considered as an unusually well defined group. From the standpoint of the adult this suborder is more closely allied to the Siricoid part of the Chalastogastra but it may be easily separated from all the Chalastogastra by the marked reduction of wing veins which resembles, except for the presence of a complete anal cell, some braconids: the curious position for the insertion of the antennae, in which it resembles the Stephanidae; in the loss of the metapostnotum in which it resembles the Clistogastra; in the remarkable invaginated ovipositor, in which it is not approached by any other Hymenopteran; in the longitudinally divided minth and tenth tergites an analogy of which may be found in some of the Clistogastra; and in the male genitalia which more closely resemble those of the Clistogastra. From the standpoint of the larva the Idiogastra are much more closely allied to the Clistogastra and it is only with hesitancy that we offer the characters in the following key, for it is certain that the larvae of the Clistogastra are very imperfectly known and it is possible that it will ultimately be found very difficult to separate the suborders Idiogastra and Clistogastra on larval characters. Briefly expressed the suborder Idiogastra stands intermediate between the suborder Chalastogastra—where the adult would place it—and the suborder Clistogastra—with which the larva would ally it.

Adult characters:—The face is prolonged below into a prominent flange, below which the antennae are inserted, and which extends laterally and posteriorly forming a scrobe for the reception of the basal part of the antenna; the antennae are inserted below the lower eye margin; the clypeus is fused with the face

¹ In some braconids (*Helconidea*, etc.) two interanal veins are present which if connected by the last apical abscissa of anal would make a wing not greatly unlike *Oryssus*.

and concealed below the facial flange; the labrum is small, free, present between bases of mandibles; the vertex is tuberculate; the antennae of the female are 10-jointed, with the ninth joint large and the apical one small, in the male they are slender, normal and 11-jointed; the pronotum is narrow, the posterior margin arcuate; the mesoscutellum is truncate anteriorly and separated from the mesoscutum by its entire width; the metapostnotum is wanting; the wings have two cubital cells, one recurrent vein and one or two closed anal cells; the anterior tarsi of the female are three jointed, of the male five jointed; the abdomen is heavily chitinized, cylindrical, the first tergite joined to the thorax by its entire width but not becoming part of the second division of the body, the second segment united with the first by its entire width and not separated from it by a socket-like joint; the first two tergites are more coarsely sculptured than the following, and the suture between the second and third is foveolate. Lying below and on each side of the eighth tergite in the female is a large heavily chitinized plate, the two together forming ventrally a channel for the reception of the ovipositor, and each bearing at its tip a small triangular appendage. These plates apparently represent the fused ninth and tenth tergites which are longitudinally divided dorsally, and the appendages are apparently the cerei; the eighth sternite is internal and lies above and somewhat behind the ninth, and is represented by two triangular plates, from the upper angle of which originate the lancets (first gonopophyses), the ninth sternite is also internal, lying below and in front of the eighth and represented by two more or less triangular plates which extend postero-ventrad; the lance (second gonopophyses) originates from the inner ends of these plates and becomes fused a short distance cephalad of its origin; the two parts of the sheath (third gonopophyses) arise from the apiecs. Shortly cephalad of the origin of the lance and lancets the latter enter the groove of the former, the complete ovipositor as thus formed extending cephalad in an inverted position enclosed within a membraneous sac, probably invaginated intersegmental skin, into the mesothorax, where it is coiled, and returning upon itself continues caudad in its normal position and enters the base of the sheath.

The reason for the formation in the pupa of the long external ovipositor is inexplicable, and its reduction to the form existing

¹ Snodgrass (Tech. Ser. 18 Bur. Ent. U. S. Dept. Agr., 1910, p. 25. Numbers.were, outer gonopophyses of the ninth sternite 2 and the inner 3. This numbering is not in accord with the numbering further on in the work. In the present paper the numbering of the gonopophyses of the 9th sternite as given by Snodgrass on p. 25, figures 7 and 8, is reversed.

in the adult is equally inexplicable. This is rendered all the more difficult to understand by the fact that in the prepupa the ovipositor is coiled as it is in the adult, while in the pupa it forms a simple loop in the thorax.

In the male the abdomen is composed largely of eight large visible tergites and nine sternites (the first being a small plate concealed under the coxae). Lying between the apices of the 8th tergite and 9th sternite are two small plates connected by weakly chitinized tissue with the 8th tergite; the exact nature of these is not clear; but apparently the connecting tissue is the fused 9th and 10th tergites and the plates themselves are the cerci. The 10th sternite is apparently fused with the large ninth and the appendages which make up the genitalia do not materially change the appearance of the 8th and 9th sternites.

Larval characters:—The larva of only one species is known and what characters are known will be found in the above description

of the larva of Oryssus.

Key to suborders of Hymenoptera.

Adults and pupae
The first adbominal segment not forming a part of the second division of the body: the first (basal plates or propodeum) and second abdominal segments united by their entire width and not separated by a socklet like articulation; in short the abdomen is not divided into two parts
 Metapostnotum present; antennae inserted above lower margin of eye; wings with more than two cubital cells and with two recurrent veins; ovipositor not conecaled or extending anteriorly into the thorax

GENUS ORYSSUS LATREILLE.

In originally proposing the genus *Oryssus* Latreille used the spelling *Oryssus*, but in his later works he corrected this lapsus to *Oryssus*. This later spelling is the better form and has been the one constantly used and should therefore be retained.

In Mr. Rohwer's synopsis of the North American species of Oryssus (Proc. U. S. Nat. Mus., vol. 43, 1912, pp. 141-158) the shape of the hypopygidium was used as a specific character and from the material which was examined at that time it held very satisfactorily. Considerable new material coming in from the West and from the East indicates that although these characters hold for a great proportion of the specimens there occasionally arises a case when it is difficult to determine in which group the individual should be placed. It seems therefore that this cannot be used as a specific character especially as all of the individuals in one of the recent series came from the same locality at the same time and under similar conditions. So far in the material now available the emargination of the facial flange (= clypeus, authors) proves reliable but it seems possible that this character too may be found to vary. If this is the case Group B. II will be a species and known as occidentalis.

Oryssus terminalis Newman.

Oryssus terminalis Newman, Eut. Mag., vol. V, 1838, p. 486; Rohwer, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 150.

Oryssus haemorrhoidalis Harris, Rept. Insects of Mass., 1841, p. 394; Rohwer, Le., p. 151.

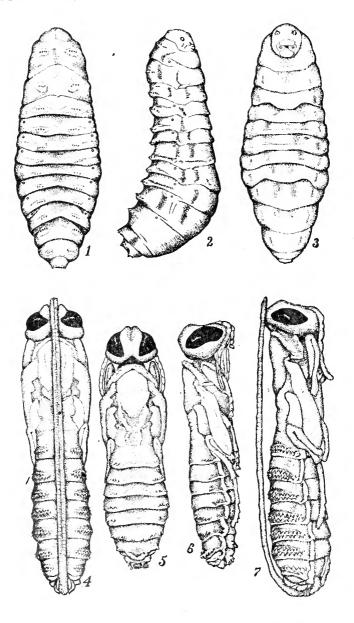
A number of specimens of this species have been collected around Harrisburg by W. S. Fisher. We have not yet been able to locate a male to go with this female, and it is possible that the male of this species will have the abdomen entirely black and that it is at present confused under the name, sayi.

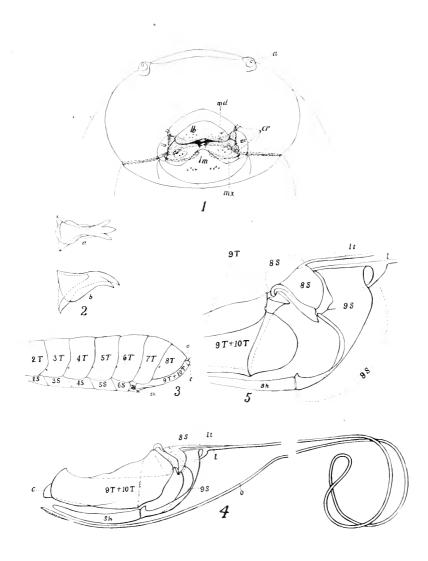
Oryssus occidentalis Cresson.

Oryssus occidentalis Cresson, Proc. Ent. Section, Acad. Nat. Sci., Phila., 1879, p. 9; Rohwer, l.c., p. 153.

Oryssus abietis Rohwer, l.c., p. 153.

In a series of specimens collected recently by Mr. Burke and his associates there are a few individuals which are intermediate in the shape of the hypopygidium between the type of occidentalis





and the type of *abietis* and it seems that they represent only one species. In the male the yellow varies from continuous inner orbital line to superorbital spots.

EXPLANATION OF PLATES.

Plate XI. Oryssus occidentalis Cress. Drawn by Miss Eleanor Armstrong.

Fig. 1. Larva, dorsal view. Fig. 2. Same, lateral view. Fig. 3. Same, ventral view. Fig. 4. Female pupa, dorsal view. Fig. 5. Male pupa, dorsal view. Fig. 6. Male pupa, lateral view. Fig. 7. Female pupa, lateral view. Plate XII. Oryssus occidentalis Cress. Drawn by R. A. Cushman.

Fig. 1. Larva, facial view of head; a, antennae; tb, labrum; tm, labium; tm, mandible; tm, maxilla; tm, chitinized ridges for articulation of mandibles. Fig. 2. Larva, mandible; tm, internal view; tm, ventral view. Fig. 3. Abdomen of female from side. Fig. 4. Detail of ovipositor and apical segments from side. Fig. 5. Detail of ovipositor, dorso-lateral view; tm = tergite; tm = sternite; tm = lance; tm = sheath; tm = ovipositor; tm = cerei.

In discussion Mr. Baker thought the elevation of the Oryssidae into a suborder would necessitate other changes in the classification of the Hymenoptera. He pointed out the generally understood position of the Oryssidae and its seeming relation with the Siricidae. He stated that in the separation of the scutellum, the one tibial spur, the loss of the notauli, proepimeron, etc.. the two families show striking affinities as well as a resemblance in the wings. The entirety of the median plate and the specialization of the head has been known even while placing the family close to the Siricidae. Even the parasitic habit was indicated years ago by Harrington. The remaining characters then, on which the suborder is erected are, Mr. Baker thought, structures in the early stages and modifications of the ovipositor due to parasitic mode of life. He thought that Ashmead may have had some notion of these structures when he suggested the family as the possible ancestor of some of the parasitic forms. Mr. Baker also pointed out that out of five genera, excluding Lithoryssus, and numerous species, the immature stages of only one species had been studied and adults of only one dissected. It is possible he thought that others might show some differences and at any rate he claimed that if the suborder were erected it would seem to carry with it the erection of some suborders in the *Petiolata*.

Replying to Mr. Baker's remarks, Mr. Rohwer said, "I do not believe that the differences between the various groups of the Clistogastra are as great or of such a fundamental character as the differences between the Idiogastra and Chalastogastra but if any one can point out such differences I would be willing to recognize such as being of subordinal value."

THREE HUNDRED AND SECOND MEETING.

March 1, 1917.

The 302d regular meeting of the Society was entertained by Dr. L. O. Howard at the Saengerbund Hall, March 1, 1917. There were present Messrs. Barber, Borden, Böving, Busck, Caudell, Cole, Cory, Cushman, Dietz, Duckett, Fink, Gahan, Garman, Gibson, Greene, Howard, Hyslop, Middleton, Pierce, Popenoe, Quaintance, Rohwer, Sanford, Sasscer, Schwarz, Snyder, Walton, and Wood, members, and Messrs. G. H. Cole, H. F. Loomis, H. S. McConnell, H. K. Plank, and E. H. Siegler, visitors; 28 members and 5 visitors.

Rev. J. A. Corcoran, of Loyola College, Montreal, Canada, was elected a corresponding member.

Under the head of program, the following papers were presented:

CODLING MOTH INVESTIGATIONS IN THE GRAND VALLEY OF COLORADO.

By E. H. Siegler.1

NOTES ON A BETHYLID PARASITE OF THE PINK BOLLWORM.

By August Busck,1

KEY TO THE NEARCTIC SPECIES OF LEPTOYPHA AND LEPTOSTYLA

By W. L. McAtee,1

¹Withdrawn from publication.

FIRST LIST OF THE DERMAPTERA AND ORTHOPTERA OF PLUMMERS ISLAND, MARYLAND, AND VICINITY.

BY W. L. MCATEE AND A. N. CAUDELL.

In this paper are summarized the results of collecting of Dermaptera and Orthoptera by members of the Washington Biologists' Field Club and others upon Plummers Island, Maryland, and along the Potomac River from Great Falls to Little Falls. (See Pl. XIII.) Like most localities this region yields species verging on the southern border and others on the northern border of their ranges. Such cases always of interest to the student of geographical distribution, are particularly so here along the boundary between the Piedmont Plateau and the Atlantic Coastal Plain. Species which have a more northerly or highland distribution include: Diapheromera femorata, Spharagemon bolli, Melanoplus scudderi, M. atlanis, Conocephalus saltans, Atlanticus americanus, A. davisi, Ceuthophilus gracilipes, Nemobius maculatus, N. bruneri, and N. confusus. Species more characteristic of the lowland and southerly regions, that occur in our area are: Ischnoptera divisa, I. couloniana, Neoconocephalus exiliscanorus, N. caudellianus, N. palustris, Orchelimum laticauda, Falcicula hebardi and Hapithus quadratus.

The number of species included in the present list by families is: Labiidae, 1; Forficulidae, 1; Blattidae, 7; Mantidae, 1; Phasmidae, 2; Acridiidae, 36; Tettigoniidae, 33; Gryllidae, 24; a total of 105.² Of this number 73 species have been taken on Plum-

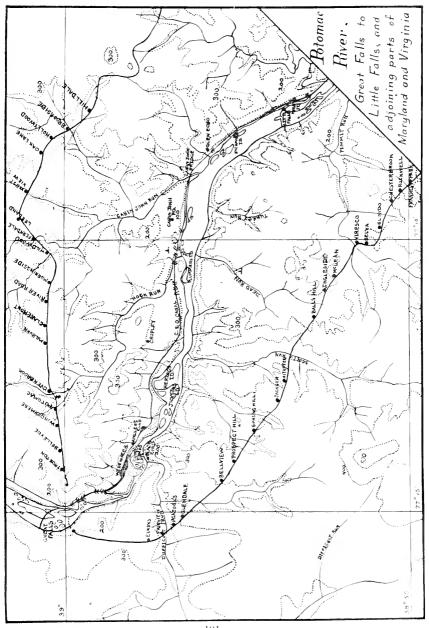
mers Island itself.

The island has an area of about 12 acres, and considering its topography the number of species of Orthoptera is high. Approximately half of the entire area is wooded lowland and it is flooded usually from 1 to 3 times annually. The higher parts of the island are rocky and the greatest elevation is 75 feet above river level. The southern exposure of the island is warm and often dry, while the northern is shaded, cooler, and usually damp. Otherwise there is little variety of ecologic conditions; there is no stream nor permanent standing water on the island, nor any open grassland.

The collectors of the material upon which this paper is based are named on subsequent pages in connection with the records of specimens taken. The points at which collecting was done may be located on the accompanying map. In this connection it is

¹ See Rehn and Hebard, 1916 (2).

² The number of species of the same groups in the list for the State of New Jersey (Ann. Rep. N. J. State Museum, 1909) is 154.



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well to draw attention to a method of labelling specimens from the vicinity of Plummers Island which has resulted in erroneous records being published. This is the use of red-spotted Plummers Island labels for specimens not taken on the island. The red spots were placed so as to indicate (map-wise) the direction from the island of the place where the specimens were taken. This system has been superseded by the use of labels such as "Maryland near Plummers Island" and others as required.

The working up of the fauna of Plummers Island has been one of the principal objects of the Washington Biologists' Field Club since it occupied the island in 1901. The present paper is the second formal list of insects for the island, the first being "An Annotated List of the Thysanoptera of Plummers Island, Maryland", by J. D. Hood (Ins. Insc. Mens. 5, Nos. 4–6, April-June, 1917, pp. 53–65). The species of syrphid flies, occurring upon Plummers Island and in the neighborhood, are indicated in "District of Columbia Diptera: Syrphidae," by Nathan Banks, C. T. Greene, W. L. McAtee, and R. C. Shannon. (Proc. Biol. Soc., Wash., 29, 1916, pp. 175–6.)

DERMAPTERA.

Labiidae.

Labia minor Linnaeus.

Apparently scarce; taken on Plummers Island, July 4, 1900, at light, H. S. Barber; September 10 and 24, H. S. Barber and E. A. Schwarz, and on Maryland shore near Plummers Island, May 23, 1915, McAtee.

Forficulidae.

Doru aculeatum Seudder.

A single female nymph of a *Doru* was taken by McAtee while sweeping vegetation in a swamp near Great Falls, Va.. August 11, 1915. The identity of the species was in doubt until at the same spot October 4, 1916, the same collector obtained numerous adults of both sexes. They were sitting on sedge stems.

ORTHOPTERA.

Blattidae.

Ischnoptera couloniana Saussure.

Chain Bridge, Va. (Rehn & Hebard, 1910, p. 436).

Ischnoptera deropeltiformis Bruner. (= johnsoni Rehn.)

Numerous records, May 19 to November 3. On Plummers Island, June 15, 1915, H. S. Barber; July 1 and 7, R. P. Currie; July 8, 1904, at light, E. A. Schwarz; and August 5, 1915, at tulip tree sap, R. C. Shannon. Maryland near Plummers Island, June 18, 1908, H. S. Barber; Chain Bridge, Md., May 19, 1911; Great Falls, Va., May 19, and August 11, 1915, McAtec. Cabin John, Md., September 23, 1911, W. D. Appel.

Ischnoptera divisa Saussure and Zehntner.

Plummers Island, July 23, 1905, H. S. Barber; also June, 1912, with ootheea.

Ischnoptera pensylvanica De Geer.

Numerous records: Plummers Island, May 24 to July 14; at light, May 29, 1911, J. C. Crawford. Cupid's Bower Island, Md., June 7, 1915, W. Perham; Jackson's Island, Md., July 12, H. S. Barber; High Island, Md., female with fresh oötheca, July 1, 1904, Candell; Great Falls, Va., July 12, H. S. Barber. Variety inaequalis taken on Plummers Island, July 10, 1910, McAtee.

Ischnoptera uhleriana Saussure.

The most common species of the genus: Plummers Island, May 20 to August 11; at light, May 23, 1911, P. R. Myers; July 9, 1902, H. S. Barber; with oötheca, August, 1912; nymphs, May 23, 1915; Jackson's Island, Md., May 18, 1902, H. S. Barber; nymphs collected at Cabin John Bridge, Md., March 27, 1902, matured May 9; Glen Echo, Md., July 11, 1914, with oötheca; some adults freshly matured and one with oötheca collected on High Island, Md., July 1, 1903, Caudell; Virginia near Plummers Island, June 10, 1902, H. S. Barber; May 17, 1908, nymph in nest of Formica obscuriventris, McAtee.

Blatella germanica Linnaeus.

Only one specimen taken April 15, 1906, McAtee, that in house at Plummers Island, where it undoubtedly was carried in a parcel of provisions.

Cryptocercus punctulatus Scudder.

This widely but sparsely distributed roach was captured on Cupids Bower Island, Md., June 23 and June 31, 1915, by H. S. Barber and R. C. Shannon, respectively. The specimens were obtained from rotten pine logs.

Mantidae.

Stagmomantis carolina Johansson.

Strange to say the mantis has not yet been taken on Plummers Island, and it appears to be searce along the upper river, though it is common enough in some directions from Washington. High Island, Md., September 29, 1902, large nymph, Caudell; Black, Pond, Va., September 14, 1913, W. D. Appel; Chain Bridge, Va. August 17, 1912, Caudell.

Phasmidae.

Diapheromera femorata Say.

Common, sometimes abundant. Plummers Island: Nymphs may be seen as early as April, become more conspicuous as the summer progresses, mature and are seen mating in September; latest adult collected November 15, 1912, H. S. Barber. One obtained November 7, 1901 (R. P. Currie) lived in captivity 2 days during which period it laid 3 eggs. Great Falls, Md., September 4, 1899; Great Falls, Va., September 12, 1912, mating, October 4, 1916, Caudell; Difficult Run, Va., October 3, 1915, McAtee; Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Manomera blatchleyi Caudell.

Plummers Island, July, 1907, W. Palmer; October 28 and November 15, 1912, H. S. Barber; Great Falls, Md., July 30, 1916, Caudell.

All these specimens are females, no males having been seen. This is also true of the many similar specimens taken on Long Island, N. Y., by Wm. T. Davis and there is a possibility that this may prove to be another species than blatchleyi. This has formerly been recorded as Diapheromera velici.

Acridiidae.

Nomotettix cristatus compressus Morse.

Maryland near Plummers Island, October 22, 1915, McAtee; Chesapeake and Ohio Canal, Seven-locks, Md., April 27, 1914, L. O. Jackson; Great Falls, Va., September 12, 1912, October 4, 1916, Caudell; May 19, 1915, McAtee; Bellview to Difficult Run, Va., September 19, 1916, Caudell; the long-winged form, atavus Blatchley, Maryland near Plummers Island, October 22, 1915, McAtee.

Acrydium arenosum angustum Hancock.

Common; Plummers Island; March 30 to October 13; Maryland near Plummers Island, April 6, 1913, W. D. Appel; April 16, 1916, D. C. Mabbott; Cabin John Bridge, Md., September 23, 1900, Caudell; May 10, 1913, W. D. Appel; Great Falls, Va., April 20, 1916, October 4, 1916, McAtee; August 5, 1904, Caudell; May 19, 1915, L. O. Jackson; Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Acrydium ornatum Say.

Great Falls, Md., August 5, 1904, Caudell; Bellview to Difficult Run, Va., September 19, 1916, Caudell; Virginia shore above Plummers Island, Md., October 14, 1914, R. C. Shannon; Maryland near Plummers Island, April 1, 1916; Plummers Island, Md., July 27, 1916, McAtee.

Neotettix bolivari Hancock.

Great Falls, Va., August 1, 1916, McAtee.

Neotettix femoratus Scudder.

Virginia near Plummers Island, June 20, 1905, McAtee.

Paratettix cucullatus Burmeister.

Common; Plummers Island, April 21 to August 26; nymphs May 11, 17 and 19. Great Falls, Md., May 23, 1915, McAtee; Virginia near Plummers Island, June 3, 4902, R. P. Currie.

Tettigidea armata Morse.

Elack Pond, Va., September 24, 1913, W. D. Appel. One♀.

Tettigidea laeralis Say.

Common; Plummers Island, March 27 to October 12; in copula May 5, 1912, J. C. Crawford. Maryland near Plummers Island, January 18 to September 1; Cabin John Bridge, Md., May 10, 1913, W. D. Appel; Great Falls, Va., May 19, 1915, October 4, 1916, McAtee; Black Pond, Va., May 21, 1911, Virginia near Plummers Island, October 25, 1914, Chain Bridge, Va., May 18, 1913, W. D. Appel.

Tettigidea lateralis Say variety polymorpha Burmeister.

More common than typical variety; Plummers Island, March 24 to October 26; in copula July 14 and 21, 1907, A. K. Fisher; Angler's Club, Md., August 15, 1915, nymph, McAtee; Maryland near Plummers Island, April 5, 1912 (in copula), to August 18;

Cabin John Bridge, Md., April 19, 1905, (in copula) to May 5; High Island, Md., November 10, 1901; Great Falls, Va., June 10 to October 4, in copula, August 1; Bellview to Difficult Run, Va., September 19, 1916; Virginia near Plummers Island, April 18 to July 24; Chain Bridge, Va., May 23, 1905, adult male in spider's web, Caudell.

Tryxalis brevicornis Linnaeus.

Plummers Island, September 29, 1915; Great Falls, Md., August 15, 1915, common in both green and brown phases, on vegetation about pond bordering canal, McAtee.

Syrbula admirabilis Uhler.

Great Falls, Md., August 15, 1915, McAtee; Maryland near Plummers Island, August 18, 1916; Glen Echo, Md., July 10, 1914, nymph, Caudell; Dalecarlia Reservoir, D. C., August 22, 1915; Bellview to Difficult Run, Va., September 19, 1916, Caudell; October 3, 1915; Virginia near Plummers Island, September 29, 1915, McAtee; Chain Bridge, Va., September 13, 1916, Caudell.

Eritettix simplex Scudder.

Maryland near Plummers Island, May 9, 1915, McAtee; Cabin John Bridge, Md., May 10, 1913; Glen Echo, Md., February 2, 1913, nymphs, W. D. Appel; July 10, 1914, Morgan Hebard (Rehn and Hebard, 1916 (2), p. 159); Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Orphulella pelidna Burmeister.

Plummers Island, September 2, 1904, Caudell; Great Falls Md., August 15, 1915, Bellview to Difficult Run, Va.; September 11, 1916; Maryland near Plummers Island, May 9, 1915, McAtee; Glen Echo, Md., July 10, 1914, Caudell; Dalecarlia Reservoir, D. C., August 22, 1915, Bellview to Difficult Run, Va., October 3, 1915, McAtee.

Orphulella speciosa Scudder.

Glen Echo, Md., August 10, 1905, July 10, 1914, Caudell.

Dichromorpha viridis Scudder.

Plummers Island, July 13 to August 29; nymphs July 14 and August 27; Great Falls, Md., August 5, 1904, Caudell, August 15, 1915, McAtee; Maryland near Plummers Island, June 17, 1913, W. D. Appel; July 14, 1915; Little Falls, D. C., August 22, 1915; Bellview to Difficult Run, Va., September 19, 1916, McAtee;

Great Falls, Va., nymphs, August 5, 1915, September 12, 1912, Caudell, October 4, 1916, McAtce; Chain Bridge, Va., September 13, 1916, Caudell.

Chloealtis conspersa Harris.

Glen Echo, Md., July 10, 1914, many of both sexes, all mature except one large female nymph; in edge of open woods, Caudell; Great Falls, Va., October 4, 1916, McAtee.

Arphia sulphurea Fabricius.

Common; Plummers Island, adults May 4 to September 1, nymphs August 4 to October 12; Great Falls, Md., June 12, 1904, Caudell; Maryland near Plummers Island, March 9 to May 9, 1915, McAtee; Cabin John Bridge, Md., May 10, 1913, W. D. Appel; Glen Echo, Md., July 10, 1914, Caudell; Great Falls, Va., May 19, 1915, Virginia near Plummers Island, May 8, 1915, McAtee; Chain Bridge, Va., May 23. Some individuals have the hind femora conspicuously bifasciate externally while in others they are unicolorous.

Arphia xanthoptera Burmeister.

Plummers Island, April 29, 1905 (nymph), D. H. Clemons, June 10, 1906, July 16, 1905, October 12 and 27, 1906; Maryland near Plummers Island, September 29 and November 3, McAtee.

Chortophaga viridifasciata De Geer.

Very common; Plummers Island, nymphs April 5 to October 20, adults at intermediate dates; Great Falls, Md., May 23 and August 11, 1915, McAtee; Maryland near Plummers Island, April 1, 1916 (nymph), McAtee; May 9, 1913, W. D. Appel, May 9, 1915, July 2, 1916, McAtee; Cabin John Bridge, Md., May 4 and 10, 1913, W. D. Appel, March 27, 1902, many nymphs, some green, some brown, and some green with top of head, thorax, and abdomen reddish brown, Caudell; April 19; High Island, Md., November 10, 1901 (nymphs), Caudell; Bellview to Difficult Run, Va., September 19, 1916, Caudell; Great Falls, Va., May 10 and 19, 1915, October 4, 1916 (nymph), McAtee; Scott's Run, Va., June 2, 1912, W. D. Appel, July 25, 1915, J. Silver; Chain Bridge, Va., September 13, 1916, Caudell.

Encoptolophus sordidus Burmeister.

Dalecarlia Reservoir, D. C., Angust 22, 1915, McAtee; Black Pond, Va., September 21, 1911, W. D. Appel, Bellview to Difficult Run, Va., September 19, 1916, Chain Bridge, Va., October 24, 1915, McAtee; September 13, 1916, Caudell.

Hippiscus phoenicopterus Burmeister.

Chesapeake and Ohio Canal, near Cabin John Run, Md., April 27, 1914, L. O. Jackson; Chain Bridge, Md., May 23, 1903, nymph collected which matured as a female June 14, Caudell; Great Falls, Va., May 19, 1915, nymph, McAtee; Virginia near Plummers Island, June 17, 1913; Chain Bridge, Va., October 24, 1915, nymph, L. O. Jackson.

Hippiscus rugosus Scudder.

Plummers Island, Md., October 1, 1905, McAtee; Conduit Road, opposite Plummers Island, Md., September 5 and 10, 1915, adults of both sexes Caudell; Bellview to Difficult Run, Va., October 3, 1915 and September 19, 1916, McAtee.

Hippiscus apiculatus Harris. (tuberculatus of authors.)

Great Falls, Md., May 23, 1915, McAtee; Maryland near Plummers Island, April 22, 1903, H. S. Barber; Cabin John Bridge, Md., May 10, 1913, Great Falls, Va., May 9, 1916, Bertha Currie; Black Pond, Va., May 21, 1911, W. D. Appel; Virginia near Plummers Island, June 20, 1909, McAtee.

Dissosteira carolina Linnaeus.

Plummers Island, Md., June 19, 1905, nymph, July 5, 1914, and July 16, 1905, McAtee; Great Falls, Md., August 5, 1904, Caudell; Maryland near Plummers Island, September 5, 1915, L. O. Jackson; Cabin John Bridge, Md., September 11, 1902, in copula, Caudell; September 23, 1911, W. D. Appel; Glen Echo, Md., July 10, 1914, nymphs and adults; Great Falls, Va., September 12, 1912, Caudell; October 4, 1916, McAtee; Bellview to Difficult Run, Va., September 19, 1916, Caudell; Chain Bridge, Va., September 13, 1916, Caudell.

Spharagemon bolli Scudder.

Plummers Island, July 16, 1905, McAtee; September 2, 1904, Caudell; September 30, 1906, A. K. Fisher; Maryland near Plummers Island, August 18, 1916, Caudell; Great Falls, Md., August 15, 1915, McAtee; Great Falls, Va., September 12, 1912, Caudell; October 3, 1915, McAtee; Black Pond, Va., September 21, 1911, W. D. Appel; Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Schistocerca serialis Thunberg. (=americana Drury).

Maryland near Plummers Island, November 3, 1906, A. K. Fisher.

Schistocerca damnifica Saussure.

A common grasshopper, Plummers Island, October 27, 1906, I. J. Condit; November 3, 1906, A. K. Fisher; Great Falls, Md., May 23, 1915, McAtee; Maryland near Plummers Island, March 19 and 27, 1915, J. C. Crawford; April 23, 1916, August 15, 1915, McAtee; Cabin John Bridge, Md., May 10, 1913; High Island, Md., November 10, 1901, Caudell; Great Falls, Va., February 26, 1905, active adult, H. S. Barber, September 12, 1912, Caudell; October 3, 1915, McAtee; October 4, 1916, Caudell; Bellview to Difficult Run, Va., September 19, 1916, McAtee; Chain Bridge, Va., September 13, 1916, Caudell; October 24, 1915, L. O. Jackson.

Schistocerca rubiginosa Harris.

Cabin John Bridge, Md., August 18, 1914, H. Nieols.

Melanoplus atlanis Riley.

Great Falls, Md., August 15, 1915, McAtee; Maryland near Plummers Island, September 10, 1915, Glen Echo, Md., July 10, 1914, Caudell; Great Falls, Va., June 26, 1914, August 11 and October 3, 1915, McAtee; October 4, 1916, Caudell; Bellview to Difficult Run, Va., September 19, 1916; Virginia near Plummers Island, July 14 and September 29, 1915, McAtee; Chain Bridge, Va., August 17, 1912, September 13, 1916, Caudell.

Melanoplus collinus Scudder.

Great Falls, Va., September 12, 1912, many, one pair mating; October 4, 1916, Caudell; Bellview to Difficult Run, Va., September 19, 1916, McAtee.

Melanoplus femoratus Burmeister.

Maryland near Plummers Island, June 29, 1913, W. D. Appel; September 10, 1915; Glen Echo, Md., July 10, 1914, large nymphs and adults of both sexes, Caudell; Dalecarlia Reservoir, D. C., July 2, 1911, W. D. Appel; Great Falls, Va., August 15, 1915, McAtee; September 12, 1912, Caudell; October 4, 1916; Bellview to Difficult Run, Va., September 19, 1916, McAtee; Scott's Run, Va., July 25, 1915, L. O. Jackson; Chain Bridge, Va., September 13, 1916, Caudell.

Melanoplus femur-rubrum De Geer.

Plummers Island, September 5, 1915, McAtee; September 30 and October 7, 1906, A. K. Fisher; C: — Pells, Md., August 15, 1915; Maryland near Plummers Island, August 16, 1916, Caudell;

September 5 and 29, 1915, McAtee; Cabin John Run, Md., October 10, 1915, L. O. Jackson; High Island, Md., November 10, 1901, Caudell; Little Falls, D. C., August 22, 1915, McAtee; Chain Bridge, D. C., September 7, September 13, 1916, Great Falls, Va., September 12, 1912, October 4, 1916; Bellview to Difficult Run, Va., September 19, 1916, Caudell; October 3, 1915, McAtee; Chain Bridge, Va., August 17, 1912, Caudell.

Melanoplus punctulatus Scudder.

Plummers Island, Md., August 11, D. H. Clemons; Cabin John, Md., August, 1907, W. Palmer; Maryland near Plummers Island, August 18, 1916, Caudell; October 31, 1915 W. Stone (Rehn & Hebard, 1916 (2), p. 246); November 11, 1915, Hebard; Bellview to Difficult Run, Va., September 19, 1916; Great Falls, Va., September 5, 1916, McAtee; October 4, 1916, Caudell.

Melanoplus scudderi Uhler.

Not so common as M. femur rubrum for instance but more frequently collected. Plummers Island, August 20 to October 27; in copula, August 20, September 10, October 11 and 23; nymphs, September 2 and 10; Maryland near Plummers Island, August 18, 1916, Caudell; September 5, 1915, McAtee; High Island, Md., November 10, 1901, Caudell; Dalecarlia Reservoir, D. C., August 22, 1915, McAtee; Chain Bridge, D. C., September 7; Great Falls, Va., September 12, 1912, Caudell; October 4, 1916, McAtee; October 31, 1915, in copula, L. O. Jackson; Bellview to Difficult Run, Va., September 19, 1916, McAtee; Chain Bridge, Va., August 17, 1912, September 13, 1916, Caudell; October 24, 1915, R. A. Emmons.

Melanoplus tribulus Morse.

Plummers Island, Md., September 30, 1906, 1 $\,^{\circ}$, A. K. Fisher: Difficult Run, Va., September 19, 1916, 1 $\,^{\circ}$ adult, Caudell.

Paroxya atlantica Scudder.

A single female taken at Great Falls, Va., August 11, 1915, by McAtee, is doubtfully referred here. A male is necessary for positive identification.

Paroxya clavuliger Serville, (= floridana Thomas.)

Plummers Island, Md., August 15, 1902, nymph, H. C. Pratt; Great Falls, Md., August 15, 1915, McAtee; Maryland near Plummers Island, August 18, 1916, September 10, 1915, Caudell; and September 29, 1915, McAtee; Great Falls, Va., September 12, 1912, October 4, 1916, Caudell; Black Pond, Va., September 21, 1911, W. D. Appel; Bellview to Difficult Run, Va., September 19, 1916, Caudell. A common species in wet places, particularly along the Chesapeake and Ohio Canal.

Tettigoniidae.

Scudderia curvicauda De Geer.

Great Falls, Va., July 23, 1914, Caudell and R. P. Currie, August 11, 1915, McAtec and September 12, 1912, Caudell.

Scudderia furcata Bruner.

Abundant; Plummers Island. August 24 to November 5; nymphs, August 27 and 29, one taken on latter date with large Tachinid larva in abdomen; Anglers' Club, Md., August 15, 1915, McAtee; Maryland near Plummers Island, August 3, 1913, W. D. Appel; August 18, 1916, Caudell; Cabin John Bridge, Md., September 2, 1907, F. Knab; September 23, 1911, W. D. Appel; October 10, 1915, L. O. Jackson; High Island, Md.; November 10, 1901, Caudell; Bellview to Difficult Run, Va., September 19, 1916, Caudell; Great Falls, Va., September 12, 1912, Caudell; October 3, 1915, McAtee; October 4, 1916, Caudell; Pimmit Run, Va., September 6, 1907, F. Knab; Chain Bridge, Va., September 13, 1916, Caudell.

Scudderia texensis Saussure and Pictet.

Plummers Island, Md., August 27, 1909, Caudell. (Rehn & Hebard, 1914 (1), p. 296.)

Amblycorypha oblongifolia De Geer.

Common; Plummers Island, July 27 to October 23; Great Falls, Md., August 15, 1915, McAtee; Maryland near Plummers Island, August 3, 1913, W. D. Appel; August 18, 1916, Caudell; Little Falls, D. C., August 22, 1915, McAtee; Great Falls, Va., September 12, 1912; October 4, 1916, Caudell; Virginia near Plummers Island, September 5, 1915, McAtee; October 6, 1911, J. D. Hood; Chain Bridge, Va., September 13, 1916, Caudell.

Amblycorypha rotundifolia Scudder.

Common; Plummers Island, June 15 (nymph) to October 2; Glen Echo, Md., July 10, 1914, Caudell; Dalecarlia Reservoir, D. C., August 22, 1915, McAtee; Great Falls, Va., September 12, 1912, Caudell; Scott's Run, Va., July 25, 1915, J. Silver; Virginia near Plummers Island, September 4, 1903, H. S. Barber.

Amblycorypha uhleri Stal.

Plummers Island, July 20, 1903, E. A. Schwarz; August 28, 1902, Barber and Schwarz; September 27, 1908, E. A. Schwarz; Maryland near Plummers Island, August 15, 1915; Great Falls, Va., October 3, 1915, October 4, 1916, McAtee.

Microcentrum retinerve Burmeister.

Common; Plummers Island, July 26 (nymph) to November 3; Maryland near Plummers Island, August 18, 1916; Great Falls, Va., September 12, 1912, Caudell.

Microcentrum rhombifolium Saussure.

Plummers Island, Md., August 28, 1902, Barber and Schwarz.

Pterophylla camellifolia Fabricius. (= Cyrtophyllus perspicillatus Auct. not of Burm.)

Abundant: Plummers Island, July 7 to November 1; female found ovipositing in bark of black walnut tree, September 22, 1907, laid an egg in same kind of bark while in confinement next day, McAtee; October 1, 1905, a female was found ovipositing in bark at night, H. S. Barber.

Neoconocephalus ensiger Harris.

Cabin John Bridge, Md., October 27, 1915, Caudell.

Neoconocephalus exiliscanorus Davis.

Plummers Island, September 6, 1909, H. A. Allard; Maryland near Plummers Island, August 3, 1913, W. D. Appel; Great Falls, Va., July 29, Nathan Banks.

Neoconocephalus palustris Blatchley.

Plummers Island, July 22, 1906 (nymph), McAtee; August 27, 1909, H. A. Allard; September 5 and 29, 1915, McAtee; October, 1907, W. Palmer; Black Pond, Va., September 21, 1911, W. D. Appel; Great Falls, Va., September 5, 1916, McAtee; Chain Bridge, Va., August 17, 1912, Caudell.

Neoconocephalus retusus Scudder.

Plummers Island, September 2, 1904, September 29, 1907, McAtee (Rehn & Hebard, 1914 (3), p. 404); Chain Bridge, Va., August 17, 1912, September 13, 1916, Caudell; Great Falls, Va., September 5, 1916, October 4, 1916, McAtee; Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Neoconocephalus robustus var. crepitans Scudder.

Plummers Island, September 2, Caudell; September 17, 1904, H. A. Allard; September 29, 1907; Maryland near Plummers Island, July 27, 1913, McAtee. Plummers Island, August 29, 1912 (nymph), Caudell, September 1, 1907 (nymph), A. K. Fisher; Great Falls, Md., August 15, 1915 (nymph); Maryland near Plummers Island, August 16, 1914, McAtee.

Neoconocephalus triops Linnaeus.

Plummers Island, August 2, September 4, 9, and 24, October 28, Barber and Schwarz; October 12, 1906, A. K. Fisher; Black Pond, Va., September 21, 1911, W. D. Appel.

Orchelimum agile De Geer.

Plummers Island, August 25, 1912, McAtee; Great Falls, Md., Anglers' Club, Md., August 15, 1915, McAtee; Chesapeake and Ohio Canal, Md., September 25, 1911, Wm. T. Davis; Cabin John, Md., September 23, 1911, W. D. Appel; Great Falls, Va., September 12, 1912; Chain Bridge, Va., September 13, 1916, Caudell.

Orchelimum Iaticauda Redtenbacher.

Common; Plummers Island, August 27 (nymphs and freshly matured adults) to October 26; Maryland near Plummers Island, September 10, 1916, L. O. Jackson; October 22, 1915, McAtee; Chesapeake and Ohio Canal, Md., September 25, 1911, Wm. T. Davis; Cabin John, Md., September 23, 1911, W. D. Appel; Little Falls, D. C., August 22, 1915, McAtee; Chain Bridge, D. C., September 13, 1916, Caudell; Great Falls, Va., September 12, 1912, Caudell; Bellview to Difficult Run, Va., October 3, 1915, McAtee, September 19, 1916, Caudell.

Orchelimum minor Bruner.

Song heard on Plummers Island and many specimens taken on Maryland shore nearby, September 6, 1909, H. A. Allard; Great Falls, Va., September 12, 1912, Caudell.

Orchelimum vulgare Harris.

Plummers Island, September 2, Caudell; September 5, 1915 (nymph and adults), L. O. Jackson and McAtee; September 30, 1906, A. K. Fisher; October 22, 1915, Great Falls, Md., August 15, 1915, Maryland near Plummers Island, August 18, 1916, Caudell; September 5, 1915, McAtee; Cabin John, Md., September 23, 1911, W. D. Appel; Cabin John Run, Md., October 10,

1915, L. O. Jackson; Great Falls, Va., September 12, 1912, Caudell (one of these specimens is remarkable in having 3 ventral spines on one hind tibia and 4 on the other; otherwise it is typical and the determination is very certain, A. N. Caudell); October 3, 1915, October 4, 1916, McAtee; October 31, 1915, L. O. Jackson; Black Pond, Va., September 21, 1911, W. D. Appel; Bellview to Difficult Run, Va., September 19, 1916; Virginia near Plunmers Island, September 5, 1915, McAtee; Chain Bridge, Va., August 17, 1912, Caudell.

Conocephalus brevipennis Scudder.

Plummers Island, August 26, 1901, R. P. Currie; August 29, 1905, H. S. Barber; September 2, 1904, Caudell; September 5, 1915, McAtee; September 15, 1907, October 12 and 13, 1906, A. K. Fisher; Maryland near Plummers Island, August 18, 1916, Caudell; Great Falls, Md., August 15, 1915, McAtee; Cabin John Bridge, Md., October 1907 (long-winged form), W. Palmer; Dalecarlia Reservoir, and Little Falls, D. C., August 22, 1915, McAtee; Great Falls, Va., September 12, 1912, Caudell; October 3, 1915, October 4, 1916, McAtee; October 31, 1915, R. A. Emmons; Black Pond, Va., September 21, 1911, W. D. Appel; Bellview to Difficult Run, Va., September 19, 1916, Caudell; Chain Bridge, Va., August 17, 1912, September 13, 1916, Caudell.

Conocephalus nemoralis Scudder.

The most common species of the genus: Plummers Island, August 25 to November 3; long-winged form, October 4, 1905, D. H. Clemons; Little Falls, D. C., August 22, 1915, McAtee; Chain Bridge, D. C., September 11, 1911, Caudell; Great Falls, Va., September 12, 1912, Caudell; October 3, 1915, McAtee; October 4, 1916, Caudell; Black Pond, Va., September 21, 1911, W. D. Appel; Bellview to Difficult Run, Va., September 19, 1916, McAtee.

Conocephalus saltans Scudder.

Cabin John Bridge, Md., October, 1907, W. Palmer; Bellview to Difficult Run, Va., October 3, 1915, McAtee; both short and long-winged females taken; this is the first eastern record for the long-winged form; Chain Bridge, Va., September 13, 1916, Candell.

Conocephalus strictus Scudder.

Dalegarlia Reservoir, D. C., August 22, 1915, McAtee; Chain Bridge, D. C., September 7; Chain Bridge, Va., September 13, 1916; Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Atlanticus americanus Saussure.

Plummers Island, August 11, 1907, McAtee; Cabin John Run. Md., September 19, 1911, W. T. Davis (Rehn & Hebard, 1916 (1), p. 81).

Atlanticus davisi Rehn and Hebard.

Plunmers Island, Md., July 5, 1905, E. A. Schwarz: Great Falls, Va., June 16, 1910, W. T. Davis (Rehn & Hebard, 1916 (1), p. 67).

Atlanticus testaceus Scudder.

Common; Plummers Island, April 21 (nymph) to September 15; Cabin John Run, Md., June 20, 1911, W. T. Davis; Glen Echo, Md., July 10, 1914, Caudell (Rehn & Hebard, 1916 (1), p. 53); Chain Bridge, Va., May 18, 1913, W. D. Appel.

Camptonotus carolinensis Gerstaecker.

Fairly numerous; Plummers Island, July 3 (nymph) to September 17; this leaf-rolling species sometimes utilizes as a substitute for ecocons of its own making, the compartments in the seed pods of *Staphylea trifolia*. Great Falls, Va., July 29, N. Banks.

Ceuthophilus blatchleyi Seudder.

Plummers Island, September 2, Caudell; October, 1909, H. S. Barber.

Ceuthophilus gracilipes Haldeman.

Fairly common; Plummers Island, May 8 (nymph) to September 22 (adult and nymphs); Cabin John Run, Md., September, 1911, W. T. Davis (Rehn & Hebard, 1916, (2), p. 27); Virginia near Plummers Island, April 28 (nymphs) to October 6.

Ceuthophilus neglectus Scudder.

The dominant species of the genus; Plummers Island, March 28 to October 26; in copula, September 24, 1905, eggs laid, September 29, 1912; nymphs, June 15, 1915 (in burrows of groundhog), H. S. Barber; October 11, 1906, Caudell; Jacksons Island, Md., August 27, 1902, H. S. Barber; Dalecarlia Reservoir, D. C., April 13, 1913, W. D. Appel; Great Falls, Va., September 12, 1912, Caudell; Black Pond, Va., September 21, 1911, W. D. Appel; Bellview to Difficult Run, Va., September 19, 1916, Caudell; Virginia near Plummers Island, April 30, 1905, McAtee; September 22, 1905, D. H. Clemons; September 30, 1905 (in copula) H. S. Barber; November 5, 1905, F. Knab.

Ceuthophilus latens Scudder.

Plummers Island, September 24, 1905, mating. Barber; October, 1909, Barber; August 12, 1914, Shannon; July 29, August 2 and 5, 1914, Caudell. Difficult Run, Va., September 21, 1916, Caudell.

Ceuthophilus spinosus Scudder.

Cabin John Run, Md., September, 1911, W. T. Davis (Rehn & Hebard, 1916 (2), p. 274).

Ceuthophilus uhleri Scudder.

Plummers Island, August 2, 1914, R. C. Shannon; September 10, 1915, October 4, 1912, October 11, 1906, Caudell; Great Falls, Md., August 12, 1912; Cabin John Run, Md., September, 1911, W. T. Davis (Rehn & Hebard, 1916 (2), p. 269) Great Falls, Va., September 12, 1912, Caudell.

Gryllidae.

Gryllotalpa hexadactyla Perty. (= borealis Burmeister.)

A few specimens have been taken on Plummers Island, a young nymph in 1906 by A. K. Fisher, another August 18, 1912, by McAtee, and an adult male which was singing by R. C. Shannon, September 14, 1914.

Tridactylus terminalis Scudder.

Glen Echo, Md., May 11, 1903. A single specimen taken by O. H. Heidemann.

Ellipes minuta Scudder.

Common. Plummers Island, April 22 (nymph) to October 5; Maryland near Plummers Island, April 8, 1914, McAtee; April 27, 1914, L. O. Jackson; June 8, 1913, McAtee; Virginia near Plummers Island, April 27.

Myrmecophila pergandei Bruner.

Plummers Island, May 1, 1914, McAtee; May 6 and 16, 1902, H. S. Barber, August 15, 1913, McAtee; September 10, 1903, H. S. Barber; October 13, 1912, J. D. Hood; Virginia near Plummers Island in nest of *Formica*, May 17, 1908, McAtee.

Nemobius bruneri Hebard.

Plummers Island, October 11 and 12, 1906, Caudell, A. K. Fisher; Cabin John Run, Md., September 23, 1911, W. T. Davis.

Nemobius carolinus Scudder.

Plummers Island, September 3 and 7, 1914, R. C. Shannon; October 12, 1906, A. K. Fisher; Great Falls, Va., September 12, 1912, October 14, 1916, Caudell; October 3, 1915, McAtee; Dead Run, Va., August 29, 1912, Caudell.

Nemobius confusus Blatchley.

Plummers Island, August 26 and 28, 1912, parasitized nymphs, Caudell, H. S. Barber; August 27, September 3, 1914, R. C. Shannon; September 10, 1915; Cabin John Run, Md., September 9, 1911, W. T. Davis (Hebard, 1913, p. 492); Virginia near Plummers Island, September 4, 1903, Caudell; September 11, 1902, Barber and Schwarz; Dead Run, Va., August 29, 1912, Caudell; Great Falls, Va., October 4, 1916, McAtee.

Nemobius cubensis Saussure.

Montgomery County, Md., September 25, 1911, W. T. Davis (Hebard, 1913, p. 461). Mr. Davis assures us this record pertains to the vicinity of the Potomac between the District of Columbia and Plummers Island. Great Falls, Va., October 4, 1916, Caudell.

Nemobius fasciatus De Geer.

Plummers Island, July 28, 1907, nymph, A. K. Fisher; August 22, 1902, R. P. Currie; September 3, 1905, A. K. Fisher; October 11, 1906, H. A. Allard. Variety vittatus Harris, Plummers Island, August 29, 1905, H. S. Barber; October 7, 1906, A. K. Fisher; October 11, 1906, Caudell; Great Falls, Md., August 15, 4915, McAtee; Great Falls, Va., August 17 and September 12, 1912, Caudell; October 4, 1916, McAtee; Bellview to Difficult Run, Va., September 19, 1916, October 3, 1915, McAtee; Chain Bridge, Va., August 17, 1912, Caudell.

Nemobius maculatus Blatchley.

Common; Plummers Island, August 9 (nymphs and adults) to October 31; Great Falls, Md., August 5, 1904, in copula; Cabin John Run, Md., September 19, 1912, W. T. Davis; Great Falls, Va., August 11, 1915 (nymph), McAtee; September 42, 4912, Caudell; October 3, 1915, October 4, 1916, McAtee; October 31, 1915, L. O. Jackson; Virginia near Plummers Island, September 4, 1903, H. S. Barber; September 11, 1902, Barber and Schwarz; Dead Run, Va., August 29, 1912, Caudell; Bellview to Difficult Run, Va., September 19, 1916, McAtee.

Nemobius palustrus Blatchley.

Bellview to Difficult Run, Va., September 19, 1916, Caudell.

Gryllus assimilis Fabricius.

Variety integer Scudder, Great Falls, Va., May 19, 1915, McAtee; variety neglectus Scudder, Maryland near Plummers Island, June 8, 1913, McAtee; variety pennsylvanicus Burmeister, common, Plummers Island, May 23, to October 27; nymphs, June 30 and August 29; Maryland near Plummers Island, April 5, 1914, L. O. Jackson; April 6, 1913, W. D. Appel; Dalecarlia Reservoir, D. C., August 22, 1915; Great Falls, Va., May 19, 1915, McAtee; September 12, 1912, Caudell; October 4, 1916, McAtee; October 31, 1915, L. O. Jackson; Black Pond, Va., September 19, 1916; Chain Bridge, Va., September 13, 1916, Caudell.

Miogryllus verticalis Serville.

Plummers Island, April 6, 1905, McAtee; June 9, 1905, Caudell; July 3, 1904, F. Knab; Great Falls, Va., October 4, 1916, Caudell; all of these nymphs; Great Falls, Md., an adult \circ , August 5, 1904 Mrs. Caudell.

Oecanthus exclamationis Davis.

High Island, Md., September 29, 1902. One female taken by Caudell.

Oecanthus angustipennis Fitch.

Plummers Island, September 9 to November 8; Chain Bridge, Va., August 17, 1912, Caudell; November 11, 1915, dead specimen, Hebard; Great Falls, Va., October 4, 1916, Caudell.

Occanthus latipennis Riley.

Plummers Island, August 19 to October 31; September 2, 1904, singing at 3.30 a.m., H. S. Barber; Maryland near Plummers Island, July 27 and August 27, 1913, W. D. Appel; August 18, 1916, Caudell; Cabin John Run, Md., October 10, 1915, L. O. Jackson; High Island, Md., September 29, 1902; Black Pond, Va., September 14, 1913, W. D. Appel; Great Falls, Va., October 4, 1916, Caudell.

Oecanthus quadripunctatus Beutenmuller.

Bellview to Difficult Run, Va., September 19, 1916, Caudell; October 3, 1915, McAtee; Virginia near Plununers Island, October 19, 1914, R. C. Shannon.

Neoxabea bipunctata De Geer.

Plummers Island, June 18, 1907 (nymph) Caudell; July 19, 1905, Barber and Schwarz; July 19, 1914, McAtee; August 12, 1907, A. K. Fisher; August 16, 1916, H. L. Viereck; August 20, 1916, R. C. Shannon; September 9 and 29, Barber and Schwarz.

Anaxipha exigua Say.

Common: Plummers Island, April 10 (nymph) to October 7; Maryland near Plummers Island, June 26, 1904, Caudell; August 18, 1916, Caudell; August 20, 1916, H. L. Vierock; Cabin John Run, Md., July 8, 1903, Theo Pergande; October 10, 1915, L. O. Jackson; High Island, Md., July 14, 1904 (nymphs), September 29, 1902, Caudell: Dalecarlia Reservoir and Little Falls, D. C., August 22, 1915; Bellview to Difficult Run, Va., September 19, 1916, Caudell, McAtee; Great Falls, Va., August 11, 1915, McAtee; September 12, 1912, October 4, 1916 (nymph), Caudell; Virginia near Plummers Island, October 19, 1914, R. C. Shannon; Chain Bridge, Va., August 17, 1912, Caudell.

Falcicula hebardi Rehn.

High Island, Md., July 1, 1904, one female taken by Caudell; Maryland near Plummers Island, June 17, 1913, McAtee; a single female taken by sweeping.

Cyrtoxipha columbiana Caudell.

Plummers Island, September 13, 1909 and September 24, 1902, Barber and Schwarz.

Phyllopalpus pulchellus Uhler.

Common; Plummers Island, July 28 (nymph) to September 15; Maryland near Plummers Island, August 3, 1913, McAtee; High Island, Md., September 29, 1902, Chain Bridge, D. C., September 13, 1916, Caudell.

Hapithus agitator Uhler.

Common; Plummers Island, August 17 to October 20; Maryland near Plummers Island, August 18, 1916, Caudell; Great Falls, Va., September 12, 1912, Caudell; October 4, 1916, McAtee; Black Pond, Va., September 14, 1913, W. D. Appel; Virginia near Plummers Island, September 11, 1902, Barber and Schwarz.

Orocharis saltator Uhler.

Common; Plummers Island, July 28 to November 8; nymphs August 14, 26, 29, and September 8 and 15; Virginia near Plummers Island, September 30, 1905, H. S. Barber, October 15, 1916, C. T. Greene and W. R. Walton; Great Falls, Va., October 4, 1916, Caudell.

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Record 15 species from Plummers Island and 25 other species from points within our area.

NOTES ON NORTH AMERICAN TACHINIDAE, INCLUDING THE DESCRIPTION OF ONE NEW GENUS.

BY HARRISON E. SMITH,

Bureau of Entomology, Cereal and Forage Insect Investigations.

Doryphorophaga Townsend.

This is evidently a valid genns, with Lydella doryphorae Riley as the genotype. Mr. Walton las considered it expedient to retain doryphorae in Neopales (Phorocera of authors) "until

¹ Proc. Ent. Soc. Wash., Vol. 14, p. 164.

² Proc. U. S. N. M., Vol. 48, p. 183.

further and more reliable external characters, especially in the case of the male, are discovered." Apparently all students of the Tachinidae, including the author of Doryphorophaga, at the time of erecting the same, have overlooked the fact that the males of doryphorae possess two pairs of orbital bristles, as do the females. This point together with other general external characters of each sex appear to substantiate the validity of the genus, and

amply separate it from Neopales.

Before the writer are 26 specimens (20 males and 6 females) of D. doryphorae, taken in Massachusetts, Penikese Island, Conn., New Jersey and Montana. Of these specimens, 20 males and 3 females show the presence of discal macrochaetae on the intermediate abdominal segments, and 3 females have them absent. Thus, it is plain that this character is a variable one; within the limits of the species, as is also, the degree of the hairiness of the eyes in the female, which may vary from moderately hairy to almost absolute bareness. As far as known, D. doryphorae is a common parasite upon the potato beetle, Leptinotarsa decembineata Say. Specimens from the western portion of the United States appear identical in every respect with those taken in the East.

For the present it is desirable to include two other described species under Doruphorophaga, namely, D. aberrans Townsend² and Exorista dorsalis Coq.3 These species are evidently congeneric, but as to whether they are congeneric with D. dorvphorae remains for further study to determine. They differ in having the facial ridges ciliate at most, on the lowest third, the ocellar bristles vestigial (not wanting in any of the 13 specimens at hand) and the abdominal chaetotaxy of aberrans and dorsalis in relation to doryphorae, are in need of more extended investigation.

Following is a synopsis of the genus, as it now stands, together with a detailed description of D. aberrans. The generic description is written under the tentative assumption, that all three species herein included are congeneric.

Diameter of head at vibrissae less than at base of antennae, vibrissae usually placed on a level with the front edge of the oral margin, eyes hairy (sometimes almost bare in females of doruphorae). Facial ridges bristly on the lowest fourth to four-fifths, antennae nearly as long as the face.

¹ In several of the specimens discal macrochaetae are present on the second abdominal segment and absent on the third. These are included in the number of specimens showing the presence of discal macrochaetae.

² D. aberrans Town., Ent. News, Vol. XXVII. p. 217.

³ Exorista dorsalis Coq., Canad. Ent., XXX, p. 236.

sides of face on the lower half bare. Frontal bristles in a single row, descending to base of third antennal joint, two pairs of orbital bristles in each sex. Ocellar bristles normal or vestigial, proclinate; second joint of arista about as broad as long, cheeks approximately one-sixth as wide as the eye height. Antennae usually inserted on or slightly above the eye middle, the abdomen bearing marginal and usually discal macrochaetae. Apical cell open, ending just before wing tip, third longitudinal vein bearing several bristles at its base, other veins bare.

TABLE OF SPECIES.

- 2. Abdomen wholly brassy gray pollinose (Mass., Conn. and Virginia),

Doryphorophaga aberrans Town.

Length 6-9 mm. Front in male about three-fourths, in female about as wide as either eye, frontal vitta opaque brownish black, not as wide as sides of front. Posterior half of parafrontals golden yellowish pollinose, anterior half and the parafacials concolorous bright silvery grav pollinose. Antennae black or faintly fulvous, the third antennal joint in each sex about three times as long as the second, arista microscopically pubescent, thickened on approximately the basal fourth, sides of face from one-third to three-fifths as wide as the median depression. Thorax marked with four black vittae besides a short median vitta posterior to the transverse suture; three postsutural and three sternopleral macrochaetae. Scutellum clothed with erect bristly black hairs on the dorsum, bearing a discal pair, three pairs of long marginals and a shorter cruciate apical pair of macrochaetae. Legs black, front pulvilli not as long as the last tarsal joint, middle tibiae on the outer front side, each bearing a single strong bristle near the middle; hind tibiae pectinate with a row of bristles of unequal length. Abdomen with a narrow median black vitta, bearing discal and marginal macrochaetae. Wings hyaline, the costal and marginal cells frequently tinged with yellow, costal spine obsolete, third longitudinal vein usually with three bristles at its base, calypteres milky white. Puparium from 7-8 mm. in length, anal stigmata slightly raised, widely separated, the dorsal surface reticulated.

Described from 3 males and 7 females reared from *Doryphora decemlineata* Say by Mr. L. B. Ripley at New Haven, Conn., September 13, 1913, and by Messrs. C. W. Collins, C. E. Hood and R. T. Webber, Melrose Highlands, Mass.

Leskia Desy, and allies.

While reviewing Dr. Townsend's recent revision of the several species included under *Leskia analis* Say, by the late Mr. D. W. Coquillett, it was evident to the writer, that errors certainly existed in the conclusions as arrived at by Dr. Townsend.

In attempting to diagnose Mr. Coquillett's study of the genus Leskia, it seems unquestionably apparent that he first included and erroneously determined Leskiomima tenera Wied, as Leskia analis of Say. He then described Myobia depile.² Later discovering his error he properly placed Wiedemann's tenera in the genus Leskiomima and made his depile a synonym of Leskia analis. Since the type of Say's analis is not in existence, to my knowledge, and must thus remain an unknown factor, it is evidently proper to recognize Dr. Townsend's Myobiobsis similis, which is at least, a recognizable species. Myobio depile Coq., however, has been entirely overlooked in the paper under consideration.

Mr. C. W. Johnson has very kindly afforded the writer the opportunity of examining one of the types of *Myobia depile* Coq., and it is quite apparent that *Leskjopalpus calidus* Town, is synonymous. Hence, the genotype of *Leskjopalpus*, by present designation, is *L. depile* Coq.

Sipholeskia occidentalis Coq.3

Myobia gilensis Town.4

♥ Spilochaetosoma new genus.

Front at base of antennae produced nearly one-half the eye width, the antennae inserted rather below the middle of the eyes. Frontal bristles descending to the base of the third antennal joint, cruciate from vertex to base of antennae, reclinate from thereon to a point nearly half way down the parafacials. Outside of the frontal row of bristles a parallel row of bristles and scattered bristly black hairs to the eye margins. Parafrontals twice as wide anteriorly as at their vertex. Orbital bristles absent, the ocellar bristles strong proclinate. Width of head at the oral margin as great as at the base of antennae; vibrissae cruciate, inserted far above front edge of oral margin, two or three bristles above each. Antennae descending to the middle of the face, the second and third joints of equal length, arista bare, the second joint as broad as long. Parafacials

⁴ Psyche, 1897, 40.

¹ Smiths, Misc. Coll., Vol. 49, p. 627-629; Jan. 1916.

Proc. Acad. Nat. Sci. Phil., p. 313; Sept. 1895.
 Smiths. Misc. Coll., Vol. 49, p. 628; Jan. 1916.

on lower half bare, cheeks nearly one-half as broad as the eye height, eyes densely hairy. Apical cell entering costa far before the extreme wing tip, open, fourth longitudinal vein appendiculate beyond bend. Abdomen ovate, bearing discal and marginal macrochaetae, the hypopygium considerably exerted and doubled forward beneath the venter. Type, the following species.

Spilochaetosoma californica new species.

Male: Robust, black, first and second antennal joints, palpi, tip of proboseis, sides of first three abdominal segments and hypopygium yellow. Frontal vitta opaque velvety dark brown, parafrontals and fascialia silvery pollinose with a faint golden tinge in certain reflections. Sides of face approximately one-half as wide as the median depression, checks thickly beset with bristly black hairs. Proboscis short, shining black and chitinized on the intermediate third, fleshy at the tip. Front at vertex nearly one-half the eye width. Thorax gray pollinose, marked with four prominent black vittae. Postsutural dorso-central bristles three, sternopleurals four. Apical two-thirds of scutellum yellowish, bearing three pairs of long marginal macrochaetae and a strong discal pair. Legs black, front pulvilli about one and one-half times as long as the last tarsal joint. Middle tibiae bearing a row of four long stout bristles on the outer front side, the hind tibiae pectinate with a row of bristles of unequal length.

Hairs of abdomen depressed. Second abdominal segment bearing a diseal and a marginal pair of macrochaetae, the third a discal pair and a marginal row, and the fourth segment a discal and marginal row. Hypopygium bearing many stout black bristles upon the first and second segments. Wings faintly infuscate along the costa, veins brownish, the third longitudinal vein bearing six or seven bristles at its base, posterior end of hind cross-vein nearer the margin of the wing than to the small cross-vein. Calypteres whitish.

Described from a male specimen taken in the mountains near Claremont, Calif., by Mr. Carl F. Baker.

Holotype:-- U. S. N. M. Cat. No. 20,930.

Under the head of notes and exhibition of specimens the following were given:

THE ELATERID GENUS OISTUS OF CANDEZE.

By J. A. Hyslop,

Bureau of Entomology.

The genus *Oistus* was described by Candeze to include two Mexican elaterids of the tribe Chalcolepidiini. The genus is very unsatisfactorily distinguished from the Oriental genus *Campsosternus*, the chief differential character used by the great

French Entomologist being the shape of the mandibles which, in a specimen of *Oistus sphenosomus* Cand, in the National Museum collection and determined by Mr. Champion, are decidedly acute at the tip while the mandibles of the specimens of *Oistus cacicus* Cand, in the same collection are truncate as in the original generic diagnosis. The genus includes at present, comprehending the species herein described, five species.

In a collection of miscellaneous elaterids collected by the field agents of the Office of Forest Insect Investigations and submitted to me for determination by Dr. A. D. Hopkins, I found a single

female belonging to this genus which is described below.

Oistus edmonstoni sp. nov.

Elongate, subparallel, depressed, shining. Color, sanguineous brown above; head, antennae, legs, and ventral surface almost black. Vestiture, long, silky and white. Head not margined in front, flattened, slightly concave and strongly punctate; mandibles acute at the tip; maxillary palpi long, terminal joint securiform; antennae moderately long and slender. Prothorax broader than long, sides nearly parallel, rounded in front, posterior angles divergent, lateral margins strongly swollen and sulcate, anterior margin rounded over the head, with a decided median emargination, posterior margin crenulate within the posterior angles; proplurae densely and strongly punctate, prosternum rounded in front with chin piece rugosely punetate, smooth and feebly punetate posteriorly. Meso-metasternal suture almost obliterated; mesosternum horizontal posteriorly and abruptly, perpendicularly deflexed in front. Posterior coxae gradually widened inwardly. Elytra four times as long as the prothorax, wider than pronotum, not striate but with three slightly elevated ridges; very finely punetate; sides parallel to apical third and then rather obliquely attenuated. Tarsi pilose beneath but not nearly so strongly as in O. cacicus Cand.; tarsal joints three and four very feebly produced below, not at all lobed. Length 27 mm., width 7.5 mm.

Type:-U. S. N. M. No. 21044, a female.

Type locality:—Ashland, Oregon, on cone of Douglas Fir, Sept. 23, 1913.

The type was collected by Mr. W. D. Edmonston for whom the species is named.

The following table will serve to separate the species now recegnized:

a. elytra metallic black or black with suture red.

b. entirely metallic black except the legs which are brown.

submetallicus

- e. tarsi broadly cordiform.

Oistus Candeze, Monogr. Elat. I, p. 338, 1857.

- Oistus cacicus Cand. 1857 Monogr. Elat. I, p. 339, Pl. VI, fig. 5 (type of the genus by present designation). Champion 1894, Biol. Cent. Amer. Col. III, pt. 1, p. 292, Pl. XIII, fig. 8. Ludius cacicus Dej. 1833 Cat. ed. 3, p. 107, Cand., l.e. Oistus griseosignatus (Dupont i. litt.) Gem. and Har. Cat. Col. V, p. 1506.
- Oistus sphenosomus Cand. 1857 Monogr. Elat. I, p. 339. Champion 1894, l.c., p. 292, Pl. XIII, fig. 7.
- Oistus suturalis Champion. 1894 l.c. p. 553, Pl. XXIV, fig. 5.
 Schwarz 1906 Gen. Ins. 46, Pl. II, fig. 13.
- Oistus submetallicus Dand. 1900 Ann. Soc. Ent. Belg., Vol. 44, p. 83.
- 5. Oistus edmonstoni Hyslop 1917 above.

NOTES ON THE BIOLOGY OF SCHIZONOTUS SIEBOLDII RATZ.1

By R. A. Cushman,

Entomological Assistant, Bureau of Entomology.

Very few cases are on record of chalcids feeding as external parasites on hosts unprotected by the tissue of their food plant or food substance or by their cocoons or other protection of the pupa. A notable example of this is found in the eulophid genus Euplectrus, the life-history of one species of which, E. comstockii Howard, is well known in its relation to the cotton worm. We are now able to add another species to the chalcids having this habit, Schizonolus sicholdi Ratz., a species introduced from Europe. In connection with his original description of this species (Ichn. d. Forstins., III, 1852, p. 230), Ratzeburg stated that it was reared by von Siebold from Chrysomela populi, and from the date of emergence judged that it must have been reared from full-grown larvae or pupae of the host.

¹ Published by permission of the Secretary of Agriculture.



On July 20 last I found a female of this species attacking a pupa of Melasoma intercuptum Hald, on alder at North East, Pa. These pupae were very abundant, attached by the caudal end to the upper surface of the leaves. I captured the parasite and placed it with pupae of the beetle in a vial. It very shortly showed interest in the pupae and began its attack upon them. positing it inserted the tip of the abdomen between the pupal legs and wings. The exposed pupa, were not again examined until five days later when all nine were found to be parasitized. Some of the parasites were in the larval and some in the pupal stage, some of the latter being already black. It is evident that some at least, and probably all, of the host pupae had already been parasitized when placed in the vial. But two, one bearing larvae and one pupae, had been parasitized for the second time and the minute larvae were feeding on the older parasites. These younger larvae were probably the offspring of the adult captured. Both larvae and pupae of the parasites were on the venter of the host and protected by the wing pads and legs. There were from 3 to 7 parasites per host. Usually one larva was attached to each of the wing pads and the rest to the venter of the host. (See Plate XIV.) When the larvae had finished feeding, the host pupa was sucked dry, but retained nearly its natural form. The pupae of the parasite were attached by their caudal end to the under side of the host remains.

At attempt was made to get the female parasite originally captured to attack pupae of *Melasoma tremulae*, but she paid no attention whatever to them. There seems to be no reason why the species should not attack *tremulae* since according to Ratzeburg, mentioned above, it was first reared from the closely allied *M. populi*. Its failure in this case to attack *tremulae* may have been due to age as the parasite died two days after the introduction of the *tremulae* pupae.

On the 30th day of July the parasitism was so great that among fifty or more pupae of the host species examined, I found only

three unparasitized.

Explanation of Plate XIV.

Schizonotus sieboldi Ratz. Larvae and pupae in situ beneath pupae of the host, Metasoma interruptum Hald.

TWO NEW HYDROPHILID BEETLES.

By E. A. Schwarz and H. S. Barber.

A species of the Hydrophilid genus *Epimetopus* Lac. 1854 (*Ceratoderus* Muls, 1851 non Westw. 1841; *Sepidulum* Lec. 1874) found in Arizona has been mentioned by the senior writer in his

introductory remarks to Dr. Boving's paper on *Hydroscapha* and requires characterization in order to enable us to distribute duplicate specimen to the workers in Hydrophilidae. Since Dr. Sharp 1874 has pointed out the close affinity of *Epimetopus* with *Spercheus* we take this opportunity to append a description of an appearently new species of the latter genus from the Philippines.

Epimetopus thermarum n. sp.

Similar to *E. costatum* Lee, but larger, piecous, except the legs and apical half of elytra which are referent, more coarsely tuberculate and with the eye completely divided by the canthus. Length 2.2 to 2.8 mm, width 1.2 to 1.6 mm.

Habitat: Arizona.

Front coarsely tuberculate, opaque; labrum smooth, shining, feebly emarginate; eanthus apparently completely dividing the eye, its upper and lower edges tuberculate and separated by shallow sulcus. Antennae 9-jointed, with loosely connected 3-jointed club; scape as long as the rest of the antenuae, bent inward and thickened apically; second joint subglobular and nearly as wide as apex of the scape; third to sixth inclusive hardly half as wide as, and together not longer than the second, first joint of club about same size as second joint of antenna, second twice as wide but not longer, last joint a little wider and three times as long as first. Last joint of maxillary palpi as long as club of antennae. Pronotum slightly wider than long, sides strongly angulate at middle, front margin produced over head, surface coarsely tuberculate with a pair of longitudinal costae uniting at basal fifth and apical tenth inclosing a lance-shaped median impression, and an outer pair of sinuate costae at lateral fourth. Elytra each with sutural, marginal, and four intermediate carinae, the second of the latter being interrupted at basal fourth. the third joining the humerus and the fourth obsolete except a trace behind middle and a prominent elongate tubercle at basal third. Intercostal areas each with two series of large round almost perforate punctures, and three series of tubercles. Tarsi 5-jointed, tibiae octagonal, the carinae with setigerous serrations.

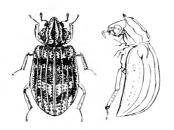
Sexes similar in all external characters.

Type and paratypes:—U. S. N. M. No. 21,052.

Described from a large series (90 specimens) collected by the writers June 24–26, 1901, in the algal accumulations at the margins of the warm stream (about 100° F.) flowing from the Castle Creek Hot Springs, Yavapai Co., Arizona. A single specimen was also taken at the same place by the writers, December 27, 1913, being the only one observed during a diligent search at that season.

At the time of our first discovery of this species the hot stream

was nearly in its original state so that the margins were lined with a considerable accumulation of dead reeds matted together with a very wet algal growth, among which this beetle, with occasional specimens of *Hydroscapha*, was slowly crawling about. Larvae, apparently of *Epimetopus*, were also collected but were lost in the fire a few days later at Williams, Arizona, which unfortunately destroyed the bulk of our alcoholic material from the Hot Springs. The specimens now before us were all preserved dry and in the washing and remounting operations, most of the females have lost their egg-sacks (cf. Sharp, 1874, p. 248) so that we have almost no biological material and this (the egg-sack) is to be described in a work on Hydrophilid biologies by Mr. E. A. Richmond.







Erc 9

In regard to the mode of life of our only previously known species of this genus which as far as we know comes from a single locality, viz., Bose Co., Texas. The senior writer remembers having seen a letter from Theo. Belfrage to Dr. John L. LeConte in which he states that the species occurs not infrequently at the swampy margin of rivers, in company with the usual riparian coleopterous fauna such as Tachys, Tachyusa, Stenus, Bledius, Heterocerus, etc. We know of no specimens except those collected by Belfrage, but Dr. Sharp 1882 records it from two localities in Guatemala.

Of the seven species now comprising the genus four are American and three are Asiatic, but only the two United States species have been seen by us; four of the other five species appear to be described from unique examples. In contrasting their descriptions the following table of species was drawn up, the most salient differences being taken from the characters there stated, and their comparative value in this table may not be trustworthy. The three Asiatic species appear to be not congeneric with the American forms, apparently having a different type of pronotal lobe and more pronounced elytral tubercles with metallic luster.

Table of Species of Epimetopus:

- - trogoides Sharp 1874.
- aa. Eyes only about half divided by the canthus
 - c. Tubereles not metallie, pronotal lobe simple (America)
 - ce. Tubercles metallic, pronotal lobe with apical elevated area (Asiatic)

 - ce. Blackish, posteriorly reddish, small apical elevated area on pronotal lobe appearing like another lobe, clypeus metallic $3\frac{2}{3}$ mm. (India)......bullatus Sharp 1874.

The literature on *Epimetopus*, as far as known to us, is as follows:

- 1851. Mulsant (Mém. de l'Acad. d. Sciences de Lyon, I, p. 1) describes Ceratoderus n. gen. for C. graniger n. sp. from the United States of Columbia.
- 1854. Lacordaire (Genera des Col., vol. I, p. 467), having seen no specimens of the genus, reproduces Mulsant's description but, being aware of the fact that the name *Ceratoderus* is preoccupied by Westwood, changes it to *Epimetopus*.
- 1874. Leconte (Trans. Amer. Ent. Soc., vol. 5, p. 47) erects the genus Sepidulum an anomalous member of the Hydrophilidae approaching the genus Ochthebius, for costatum n. sp. from Texas, collected by Belfrage.
- 1874. Sharp (Entom. Mo. Mag., vol. 11, pp. 247-250) discusses the characters of Leconte's genus Sepidulum, finding that the tarsi are 5-jointed and refers to the structure of the abdomen. He places the genus near Spercheus and describes Sepidulum trogoides n. sp. from "South America or possibly Mexico" and Sepidulum bullatum from India.
- 1882. Sharp (Biol. Centr.-Amer. Coleopt., vol. 1, pt. 2, p. 88, pl. 3, fig. 3) places Sepidulum as a synonym of Lacordaire's genus Epi-

- metopus, figures the Texan *E. costatum* and records its occurrence at two localities in Guatemala. He remarks "the species of this genus are probably riparial rather than aquatic in their habits."
- 1883. LeConte & Horn (Class. Col. N. A., p. 71) recognize the synonymy of *Sepidulum* with *Epimetopus* and place the genus among the Helophorinae.
- 1890. Sharp (Trans. Ent. Soc., London, p. 355) describes *Epimetopus flavidulus* from Kandy, Ceylon (one specimen).
- 1903. Regimbart (Ann. Soc. Ent. Fr. LXXII, p. 338) describes Epimetopus maindroni n. sp. from the moat of the fortress of Gengi, southern India.
- 1908. Schwarz (Proc. Ent. Soc. Wash., vol. 9, p. 115) alludes to structures of the Epimetopus from Arizona.
- 1914. Schwarz (Proc. Ent. Soc. Wash., vol. 16, p. 165) lists Epimetopus nov. spec. among the species occurring in the middle course of the warm stream.
- 1916. d'Orchymont (Ann. Soc. Ent. Fr., vol. 85, pp. 101 and 105) proposes eight subfamilies of Palpicornia, the third and fifth being respectively the Spercheinae and Epimetopinae, the latter being suggested provisionally on adult characters since its larval stages are unknown.

Spercheus stangli n. sp.

Shining, coarsely punctate with sparse short erect squamae, piceous, the elytra variegated with fine irregular pale markings and each with three tubercles in addition to the humeral umbone. Length 3½ mm.

Habitat: Philippine Islands.

Head with sparse squamiferous punctures, margin deflexed at middle and straight for one-third width of head, thence elevated into a marginal flange which extends obliquely backward and encroaches slightly onto the eye. Pronotum two and one-fourth times as wide as long, widest at apical third, front angles a little produced anteriorly, side margins arounte to middle, thence straight to hind angles which are obtuse; base feebly sinuate close to hind angles and at lateral third; surface smooth, impunetate and highly polished basally, becoming coarsely punctate in the lateral depressions and on the pair of transverse anterior median callosities which are separated by a median impressed line obsolete in median third. Elytra about four-fifths as wide as long, widest at basal third, with side margins strongly expanded laterally, evenly rounded in basal half, thence straight and convergent to near apices which are strongly and not conjointly rounded; surface coarsely, closely, subscriately punctate, with a very pronounced pair of gibbosities near suture at apical fifth, another nearly as pronounced just behind middle and about halfway between suture and margin, and a less conspicuous pair at basal sixth and half way between the suture and the very prominent humeral gibbosity. Tibiae 6-carinate.

Type and paratype U. S. N. M. No. 21,053.

Described from two specimens received in 1901 from P. L. Stangl which are labelled Bay, Laguna Province, Philippine Islands. In the type the humeral umbone is produced posteriorly into a carina for a third the length of the elytra and the outline of the head is slightly different but these are believed to be variational or sexual differences. When received both examples were covered with a thin opaque grayish encrustation which entirely obscured the surface sculpture, exposing only a few of the club-shaped setae on the margins and on the tubercles. With the aid of a fine needle it was possible to scale off this incrustation from one side of one specimen; the setae being fast in the incrustation were naturally removed with it.

Fourteen species are now recognized in the genus only two of which are before us. From the literature at hand the twentytwo specific names proposed in this genus may be listed as follows:

List of Species of Spercheus.

algoensis Peringuey 1892.	
australis Peringuey 1892	
capicola Peringuey 1892	
cerisyi Guérin Ménéville 1835	Egypt
cerysii Lacordaire 1854	
(costatus Castelnau 1840) = senegalensis	
crenulatus Fairmaire 1893, Kolbe 1897	.East Africa
crenaticollis Regimbart 1906	
distinguendus Fairmaire 1893 and 1903) = senegalensis	
emarginatus Auctorum	Europe
luridus Mathieu 1858	•
sordidus Marsham 1802	
verrueosus Marsham 1802	
hovanus Fairmaire 1903	Madagascar
humeralis Regimbart 1906	
interruptus Fairmaire 1892	
(luridus Mathieu 1858) = emarginatus	Dase Timea
mulsanti Perroud 1864	on Culodonia
priscus Sharp 1875, Fauvel 1883	
platyeephalus MacLeay 1825, Castelnau 1840, Lacordaire 185-	HJava
(priscus Sharp 1875) = mulsanti	(1
	Senegal
senegalensis Laporte 1832, Guérin-Ménéville 1835, Castelnau	Dahomey
1840, Lacordaire 1854, Fairmaire 1893, 1903	Angola
1010, Intertaine 1001, 1 thrilliant 1000, 1000, 1100	Madagascar
	Zanzibar
sulcatus Gory in Guérin-Ménéville 1835.	

costatus Castelnau 1840.

A NEW COLEOPHORA INJURIOUS TO APPLE IN CALIFORNIA,1

(Lepidoptera; Coleophoridae.)

By CARL HEINRICH,

Specialist in Forest Lepidoptera, U. S. Bureau of Entomology.

Coleophora volckei n. sp.

Palpi iridescent ochreous on outer sides, silver white around base of second joint and on entire inner side, long slender; third joint two-thirds as long as second; a rather prominent tuft on joint two. Antennae silver white below, white above faintly banded with golden ochreous; basal joint tufted above with ochreous seales. Tongue white at base shading to ochreous. Face, head, and thorax iridescent ochreous. Forewings uniform iridescent ochreous. Hind wings a trifle more grayish; cilia of fore and hind wings concolorous, grayish ochreous, somewhat more yellowish at base. Legs silver white streaked with blackish ochreous on the outsides. Abdomen white below, ochreous above; anal tuft ochreous with a few white scales interspersed. Alar expanse 15 mm.

Habitat.—Watsonville, Cal.

Food Plant.—Apple.°

Type.—Cat. No. 21464 U. S. Nat. Museum.

Described from five moths reared June 7-11, 1916, at the Bureau of Entomology from larvae collected by Mr. W. D. Volcke, who states that the species is injurious to apple in California, mining the leaves and occasionally feeding upon the fruit itself. Superficially the species resembles the eastern apple feeder, C. fletcherella Fern., but is readily distinguished by its larger size, the white markings on palpi, legs, and abdomen and its very different larval case.

⁴ Due to the unexpected delay in the publication of this article this species was described in an article on its biology by W. D. Volcke, Mo. Bull. Calif. Comm. Hort., vol. 7, 1917, p. 463–467.

The case is of the *leucochrysella* type, 7 to 9 mm. long x 3 to 5 mm, wide at the widest part, with posterior end hook like and flatly

compressed; mouth deflected to 90 degrees.

Full grown larva about 7 mm. long; uniform dark brown; head darker brown, more heavily chitinized areas black; pro- and mesothoracic shields black, divided; anal shield, erochets of abdominal prolegs, prespiracular plate of prothorax, tubercle III of meso- and metathorax, chitinous plate above anal prolegs and more strongly chitinized parts of legs jet black.

This species is named in honor of the collector Mr. W. D. Volcke.

THREE HUNDRED AND THIRD MEETING.

The 303rd regular meeting of the Society was entertained by the Hymenopterist members at the Saengerbund Hall, April 5, 1917. There were present Messrs. Barber, Cole, Cushman, Dietz, Ely, Gahan, Greene, Howard, Kotinsky, Middleton, Pierce, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Spear, and Viereck, members, and Messrs. Dr. J. Chester Bradley, R. M. Foutz, Ira N. Gabrielson, A. C. Johnson, and M. A. Murray, visitors.

The secretary announced that the Executive Committee had acted favorably upon the name of Mr. H. S. McConnell of Maryland State College for corresponding member and on motion the secretary was instructed to east the ballot of the Society in his favor.

Under the head of proposals of new members, the following names were proposed for corresponding members: Mr. Shirley L. Mason of the U. S. Entomological Laboratory, West Lafayette, Ind., by Mr. Greene; Dr. H. T. Fernald of Amherst, Mass., by Mr. Rohwer; and Mr. Max Kisliek of Ohio State university by Mr. Gahan.

Under the head of program the following papers were presented: The Relation of Natural Conditions in the Cotton Belt to Insect Distribution and Behavior, by W. D. Pierce.¹

"Some Notes on the Classification of Cerambycid Larvae," by F. C. Craighead.

A. B. Gahan.

¹ Withdrawn from publication.

A NOTE ON THE TORTRICID GENITALIA.

By Carl Heinrich.

Specialist in Forest Lepidoptera, U. S. Bureau of Entomology.

In his "Hand-book of the British Lepidoptera" (1895), Meyrick separates the two Tortricid families *Epiblemidae* (Olethreutidae), and Tortricidae by the presence or absence of hair on the lower median veins of the hind wings, and by the development or non-development of the uncus of the male genitalia, characterizing the two families as follows:

Epiblemidae; lower median vein of hind wing hairy towards base: uneus not developed.

Tortricidae; lower median vein of hind wing not hairy towards

base (except Sparganothis); uncus developed.

In as much as the basal pectin on the hind wings is found in several Tortricid genera (Sparganothis, Amorbia, Synnoma) as well as in the Olethreutidae (Epiblemidae), such a striking difference as the presence or absence of a developed uncus, if constant, would be a valuable character for defining the limits or the two families which all authorities accept as natural groups. In his later works, however ("Revision of Australian Tortricina," 1910–1911, and "Genera Insectorum, Tortricidae," 1913), Meyrick makes no mention of genitalia and as far as I know no one else has criticized his original statement.

In an effort to find some adult characters to match with certain structural differences in the larvae I have had occasion of late to examine the male genitalia of a number of Olethreutids and found to my surprise that a well developed uncus was quite a common occurrence in that family. Six geno-types (Olethreutes arcuella, Ancylis laetana, Enharmonia woberiana, Proteopteryx emarginana, Bactra lanceolana, Eucosma similana, (type of the Hubner's Epinotia) and Rhopobota naevana all show the part prominently developed. It is absent or rudimentary in a majority of the species now listed under Eucosma. In E. raganoti Wlsm., faenella L. and invicta Wlsm. it is merely a rounded hairy prominence at the end of the integument.

In E. biluniana Haworth, E. castaneana Wlsm., and E. agricolana Wlsm. it is short and bifurcated, while in stigiana Dyar and restaliana Zell, it is long, bifid, and heavily chitinized. In several species of the genus Olethrentes it is quite prominent, taking various fantastic shapes. Proteopteryx emarginana Wlsm. has a long narrowly spatulate uncus, while bolliana Slingerland, listed under this genus, has none, and P. deludana Clem. has the uncus long and bifid with the extremities well spread apart. On the other hand the uncus is much less prominent on Tortrix viridana

L. (the type species of the Tortricidae) than on many true Olethreutids.

It can readily be seen therefore, that the presence or absence of this part means nothing as far as family or sub-family distinctions in the *Tortricoidea* are concerned. At best it is a generic difference and under the present accepted classification not even that.

There is, however, a rather striking difference between the genitalia of the Tortricids and Olethreutids in the structure and development of the harpes. In the *Olethreutidae* (except in a few species where the costal margin is free to the base thus forming double harps) the harps are strongly chitinized, emarginate, with sacculus not extended into a free arm but fused with the costa, leaving a more or less restricted opening at the base, the costal edge projecting in the form of a short hook; usually a well defined anal angle, cucullus and corona; transtilla absent.¹

In the *Tortricidae* the harpes are shorter in proportion to the whole genitalia usually rather weakly chitinized; widest at base: tapering or squared; without pronounced anal angle, or well defined cucullus or corona; sacculus narrow and not fusing with

costa: transtilla normally present and developed.

From the Glyphipterygidae which they equal in all other genitalic characters, the *Tortricidae* may be distinguished by the articulation of the aedoeagus: In Tortricidae it articulates on an arm (or forked projection) from the plate of the Juxta. In Gly-

phipterygidae it passes through an opening in the plate.

As a means of specific identification among the Olethreutids, particularly between American and European species which are apt to be confused, the male genitalia are of immense value. Between closely related species the differences in structure are often marked. Consistent generic characters are more difficult to discover. At first glance this seems hopeless in the *Tortricoidea*. It is very probable, however, that even here we may find good characters for generic differentiation if proper allowance is made for the wide range of specific modifications and if such characters as hold constant for several species are checked against the more diagnostic setal and venational character of the larva and adult.

Alone and unsupported they would not be a safe guide for the classification of genera.

The terminology of the parts is adopted from F. N. Pierce, 'Genitalia of the British Noctuidae'' (1909), and "Genitalia of the British Geometridae'' (1914).

THE AMERICAN SPECIES OF THE GENUS CEPHUS LATREILLE.

By S. A. Rohwer,

Forest Insects, Bureau of Entomology, Washington, D. C.

This paper, which is a contribution from the Branch of Forest Insects, Bureau of Entomology, is the result of a careful study of a large series of specimens of *Cephus* reared from the stems of various grass-like plants and is an attempt to separate the species which are injurious to American Cereal and Forage crops. For a number of years the writer had been of the opinion that there were a number of distinct forms responsible for the damage done to cereal and forage crops in the west, but a critical examination of a large series from the same locality and host has proven that the forms previously distinguished are only extreme variants of the same species and that there are all the necessary intermediates to show that there is only one species involved.

The introduced, European, Cephus pygmaeus (Linnaeus) is very similar to the native species common throughout the west and it is difficult to find characters which distinguish the two in all their forms. The characters offered in the following key are, however, reliable for the material available.

KEY TO THE NORTH AMERICAN SPECIES OF CEPHUS.

Cephus cinctus Norton.

Cephus cinctus Norton, Tran. Amer. Ent. Soc., vol. 4, 1876, p. 86. Cephus occidentalis Riley and Marlatt, Insect Life, vol. 4, 1891, p. 177. Cephus graenicher: Ashmead, Can. Ent., vol. 30, 1898, p. 182.

The above listed synonymy was first pointed out by Konow in his Chalastogastra, p. 265 (published in Zeit. Hym. Dipt., 1905, p. 249). The species *cinctus* is subject to considerable variation in color and structure. The variation in structure consists of the variation in the relative lengths of the postocellar line as compared with the ocellocular line. The postocellar line varies from distinctly shorter (as high as a ratio of 5 to 7) than the ocellocular line, to subequal with it, to longer (as high as a ratio of 7 to 5.5) than the ocellocular line. In a series of twenty-

one measurements of females reared from stems of *Elymus condensatus* collected at the same place and same time, thirteen had the postocellar line shorter than the occllocular line, five had the two lines subequal, and three had the postocellar line longer than the occllocular line. And in this series of measurements there was all degrees of differences so in some cases the smallest fraction of a millimeter would have placed the individual in the other series. The other structural variation consists in the extent of the depression in front of the anterior occllus, in the smaller individuals it is very restricted while in some of the larger ones it extends to the position the middle foeva would occupy.

The range of variation in color is great but all of the extremes and necessary intermediates were found in the series from Elymus condensatus. The face in the female may be mostly yellow but normally it is black. The scutellum may be mostly yellow, or with two spots, but in most specimens it is black. The venter is usually marked with yellow but in a few specimens it was entirely black. The femora are usually mostly yellow but in some of the specimens (usually smaller individuals) they are almost entirely black and there is every degree of variation between. The wings vary from hyaline to distinctly infuscated. The antennae are usually 20 jointed, but in some specimens there were only 18 joints. The banding of the tergites is extremely variable.

Specimens reared from the stems of the following have been examined: Elymus sp.; Elymus condensatus; Elymus canadensis; Agropyron smithii; Phleum pratense; and wheat.

Specimens from California, Utah, Colorado, Montana, Wisconsin, and Manitoba. This species has a more extended range but inasmuch as it will be treated in an economic paper where its distribution will be discussed a full account of the distribution is omitted from this paper and the above discussion is based on specimens from the states listed above.

Type of cinctus Acad. Nat. Sc. Phil.; type of occidentalis Cat. No. 20175 U. S. N. M.; type of gracnicheri Cat. No. 6842 U. S. N. M.

Cephus pygmaeus (Linnaeus).

This species has been treated in considerable detail in economic papers and need not be discussed here. Specimens have been examined from the following localities: Europe (many localities), Ithaca, N. Y. and Ottawa, Canada. As far as the American material is available it would seem that this species has not spread widely nor has it been of much economic importance in recent years.

(Cephus) Janus rufiventris (Cresson).

Konow leaves this species in *Cephus*, but Dr. J. C. Bradley who has examined the type, which is Cat. No. 534 Acad. Nat. Sc. Phil., has kindly permitted the writer to state that the species belongs to the genus *Janus*.

A PECULIAR HABIT OF A HORSEFLY (TABANUS AMERICANUS) IN THE FLORIDA EVERGLADES.

By Thomas E. Snyder.

On March 25 to 29, 1917, I visited Mr. C. A. Mosier's camp (plate XV, fig. 1) in Royal Palm Hammock, about 48 miles southwest of Miami, Dade County, Florida, to collect termites. On March 26, at about 4.45 a.m. (central time) a peculiar buzzing was heard, which increased in volume until it became a dull roar. Mr. Mosier stated that this was caused by a large horsefly (specimens were identified by Mr. C. T. Greene, as *Tabanus americanus*) and that this buzzing had been going on for 10 days to 2 weeks at about the same hour in the morning, but that it was at its height about 1 week ago and was now waning. The adults were flying in countless thousands. Mr. Mosier did not notice this habit last year and my observations indicated that this species was not especially common last year either at Royal Palm Hammock (Paradise Key) or Miami.¹

Observations were made on the flight each morning. The flies took to the wing at the "peep of day" when the birds commence to sing and a few of the stars are still visible. The buzzing commences gradually but increases very rapidly in volume to a dull roar. The whole flight lasts only about 20 minutes and is at its height for about 15 minutes gradually increasing and subsiding. At sunrise on March 26 about 5.20 the buzzing had been over for some time, the last adults flying at 5.05 and the flies had quieted down and only flew when disturbed. During the flight the gradually increasing buzzing attracts other flies till all are on the wing; the flies can be heard as they leave the tree trunks, where they have been resting and striking the foliage with their wings, as they rise up through the trees. They fly above the tree tops and can be observed all over the hammock, the buzzing is loudest in the main hammock, which is the largest in area.

Individuals hover in the air in one spot in openings in the forest canopy (where the tree crowns don't overlap) and over the

¹ Snyder, T. E. Horseffies as a Pest in Southern Florida.' Proc. Ent. Soc. Wash., Vol. XVIII, No. 4, December, 1916 (June 11, 1917), pp. 208–210.

road; this habit resembles that of the flower flies (Syrphidae). Occasionally the flies dart towards one another after hovering, and rarely two can be observed clinging together, and after a short period rapidly dart away. Mr. Mosier's opinion is that this is a mating flight. Birds do not disturb the flies, possibly

being alarmed by the noise.

On March 27, observations were again made and conditions during the flight were similar. During the night of the 27th, it was noted that there was no flight, observations being made at 12.10 and 3.15 a.m. At 1.20 a.m. on March 28 no adults were flying. At 4.09 a.m. I arose, went into the hammock in the dark and carefully noted the exact time when the flight began; this was at 4.44 a.m. and was at its height for 15 minutes and then waned and ended at 5.03. There was quite a little low-lying fog on the morning of the 28th. The buzzing appeared to be not as loud as on the 27th.

On the morning of the 28th, at about 10.30, a heavy thunder shower came up and there were showers until late in the afternoon. I was in a hammock at Long Key about 5 miles northwest of Royal Palm Hammock, during the rain and noticed that afterwards the flies were especially persistent in attempting to jab one. At Royal Palm Hammock on our return when Mr. Mosier and I were changing our wet clothes in an open shed they were several times successful.

The morning of the 28th was damp and chilly and the flight began a little later and was not as strong; the flight began at 4.46 and adults were flying until 5.04; hence the flight was of slightly shorter duration. During the day of the 29th, which was partly cloudy, adults of this Tabanid were very annoying in the hammock. They congregated about our tent, in a shed, and swarmed about moving vehicles along the road. Mules were clothed in closely fitting but not tight gunny sacking for protection—only a partial protection! On the morning of the 29th a male of *Tabanus americanus* was found among leaf mold on the forest floor. Males in this species and other Tabanidae are rare.

In general, during the day time this horsefly is the common species along roads and in the hammocks; in the latter locality it rests on the tree trunks and only flies when disturbed or when quarry comes along. These large Tabanids are very annoying while collecting in the hammocks; the bite or prod feels like a red hot needle. Mosquitoes and deer flies (*Chrysops* spp.) make a veil and gloves necessary, especially if one stands in one place for any length of time.¹ Heavy flannel army shirts, khaki riding

¹ The Seminole Indians have descriptive names for horse lies and mosquitoes; these insects doubtless are very annoying to the Indians; O-heav is mosquito and Chil-lock-o-do-no means horsefly.

breeches and a cap were penetrated. One is attacked through clothes especially where they are stretched tightly.

At Hobe Sound, Florida, the protective cloth covering of the mules gave them a grotesque appearance which reminded one of the head coverings of the mounts of the Klu-Klux Klan, there

being holes for the eyes but even the ears were covered.

Tabanus americanus occurs at Royal Palm Hammock and in Hammocks on Palma Vista and on Long Key. None were noted on Adam Key, an offshore key 27 miles south of Miami; a smaller species was collected there. This species was occasionally seen last year at Miami but none have been seen this year either at Miami or in the mangrove swamps at Miami Beach. In the pineland at Palma Vista and Long Key where the ground consists of an eroded dirty greyish white oölitic limestone, the flies were also abundant. This stone is more exposed in the pinelands where areas have been burned over. In hammocks in this area this rock is covered over (but not filled) with vegetation or humus and leaf mold. Deep holes, i.e., "lime sinks" occur in this formation, which are now dry.

DESCRIPTION OF ROYAL PALM HAMMOCK.

Dr. J. K. Small, of the New York Botanical Garden, has explored this region botanically and described conditions at Royal Palm Hammock in an illustrated article in the Journal New York Botanical Gardens, 17, pp. 165–172, October 1916. Small states that the headwaters of the Taylor river separate the Everglade Keys, in extreme southeastern peninsular Florida, into two natural divisions, the Biscayne pineland and the Long Key pineland. Among the forks and sloughs of this river are many "Keys" or islands clothed with "hammock" vegetation (a hammock is dense growth mostly of broad-leaved trees and shrubs, giving shade in a pineland or sawgrass "prairie"). Royal Palm Hammock is the largest of these. It stands out prominently in the land-scape and may be seen for a long distance (10 miles) across the prairie. Many of the royal palms tower above the other hammock trees. (Plate XV, fig. 2.)

Royal Palm Hammock lies a little south of the main axis of the Everglade Keys, 14 miles southwest of Homestead. The unfinished Ingraham highway (plate XVI, figs. 1 and 2.) connecting Miami and Cape Sable, Florida, runs through this hammock. In building this road, rock was dredged from the side of the road leaving ditches which contain fresh water. Catfish, perch,

"gar" and "brim" live in these ditches.

The Everglades and the hammocks are dry at this time of the year (1917); Mr. Mosier states that an unusually heavy rainfall

⁴ The term key largely replaces the word island in southern Florida and is applied to islands near the coast and also to islands in the Everglades.

occurred on March 4, 5, 6, and 7, 1917 (about 7 inches), and that this was a month early for the spring rains. The "prairie" is the higher portion of the sawgrass "Everglades;" the "slough" the lower portion, where the water drains off during the wet The bottom of the slough is now dry but is matted down with thinly caked mud: the sawgrass grows over this to a height of 2 to 3 feet at this season. This area of prairie and slough is under water from 3 to 8 months of the year, according as to whether the season is wet or dry.

Mr. Mosier states that in 1916, the prairie was covered with water in August, October, and February, 1917. The source of the Taylor river at the east end of the hammock is covered with pads of the yellow water lily; pickerel weed also grows in the There is no current when the slough is dry, as now.

The trees of Royal Palm Hammock, aside from the royal palms are mostly sub-tropical species, including live oak (plate XV, fig. 1), sweet bay magnolia, cocoa plum, pigeon plum, wild tamarind, West Indian cherry, gumbo limbo, strangling fig (Ficus aurea), sabal and saw palmetto. Spanish moss (plate XV, fig. 1), epiphytic growth, ferns and vines cover these trees. Especially striking is the long grey Spanish moss and the sleeping or resur-This fern (Polypodinum polyoides) lives on the rection fern. upper side of tree limbs and is dry and a dirty brown till there is rain fall, then it becomes a beautiful green mass.

There is a dense tangle of undergrowth; a variety of ferns grow luxuriantly, especially large beds of the Boston and royal (Dryopterus and Drypetes). The forest floor is rich in black humus and is covered with a coarser leaf mold. Before the beavy rain on the 28th the humus and leaf mold was very dry but afterwards it

became very damp.

Mr. Mosier is responsible for all the plant names.

It is warm in the hammocks in spite of the dense shade, since there is but little air in circulation, owing to the dense jungle of

hanging vines and undergrowth.

It is interesting to note in connection with abundance of this large Tabanid and other horseflies, that Anthrax of horses and cattle does not occur in Dade County, Florida, according to several reports.

Dr. Small refers to the animal life of the Everglades in his paper. C. T. Simpson¹ and Mrs. W. S. Jennings² have described conditions

at Paradise Key.

The accompanying photographs were made by E. C. Loveland of Homestead and W. E. Brown of Miami, Florida.

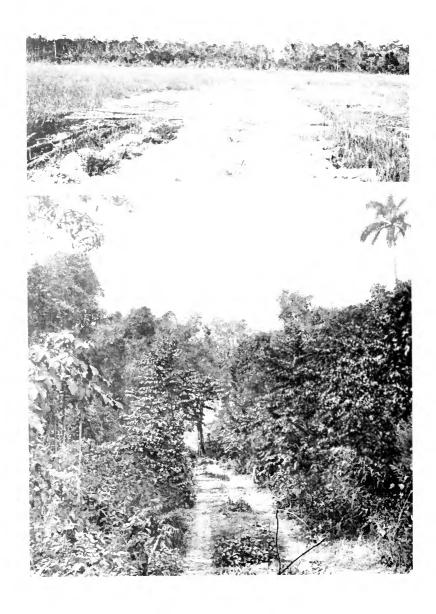
hammock.) Ibid., pp. 10-16 and 26.

¹ Simpson, C. T. "Paradise Key." The Tropic Magazine, Vol. IV, No. 1, pp. 1-9, April, 1916. (Illustrated.)

² Jennings, W. S. "Royal Palm State Park." (Lists trees on the







APPENDIX TO A PECULIAR HABIT OF A HORSE FLY (Tabanus americanus)
IN THE FLORIDA EVERGLADES,

March 30.—Dawn fair, flight not so strong, but lasted until sunrise.

March 31.—Dawn fair, flight stronger than on 30th.

April 1 to 7.—Flight continued normal; noticed a few of another species of Tabanid.

April 8 to 9.—Absent from park, no observations.

April 10 to 14.—Noticeable diminution of volume of flight. Observed many of the flies during day especially during early morning hours feeding on flowers, counted from 5 to 34 on various small sweet bay trees, also on coco plum, myrtle and salt bush, which are in bloom.

April 15 to 22.—Feel sure that these flies feed on flowering plants in absence of animal life, have been standing beside road where most flowering plants are and observing them leave the plants for mules and negroes as teams pass. Have observed closely and think they are feeding on nectar rather than pollen. Veranda screens trap them by the thousands, have left screen down open late evenings and early mornings they dart about striking the screens until they drop exhausted, we have to sweep the veranda floors every day to get rid of them.

This other species is far more numerous than *T. americanus*. April 23 to June 30.—Other Tabanid abundant, no flight of this insect as in case of *T. americanus*; only scattering specimens of *T. americanus* appearing now.

July 14.—First appearance of brown Tabanid.

July 15 to August 23.—Only occasionally the other Tabanid and brown Tabanid not as common as former years.

Unable to observe any Tabanids depositing eggs or mating. Have found few large Dipterous exuviae in leaf mould while picking up palm seed; believe these to be Tabanid exuviae but am not certain.

March 30 to August 23, 1917. Royal Palm Hammock, Paradise Key, Dade County, Florida, C. A. Mosier.

PLATE XV.

Fig. 1. Site of C. A. Mosier's camp at Royal Palm Hammock.

Fig. 2. Royal palm tree overlapping other hammock trees.

PLATE XVI.

Fig. 1. Royal Palm Hammock seen from the prairie.

Fig. 2. Royal Palm Hammock, Ingraham Highway, near Mosier's camp. *Tabanus americanus* was abundant hovering over this road at 4.45 to 5.05 a.m. only.

THREE HUNDRED AND FOURTH MEETING, May 3, 1917.

The 304th regular meeting of the Society was entertained by the Society members from the Federal Horticultural Board at the Saengerbund Hall, May 3, 1917. There were present Messrs. Abbott, Baker, Barber, Böving, Busck, Cushman, Dietz, Ely, Fisher, Gahan, Carman, Greene, Kotinsky, Middleton, Morrison, Paine, Rohwer, Sanford, Sasscer, Schwarz and Wood, members, and R. M. Fouts and Edwin P. Selkregg, visitors.

Mr. Shirley L. Mason, of the U. S. Entomological Laboratory, West Lafayette, Indiana, Dr. Henry T. Fernald of Amherst, Massachusetts and Mr. Max Kisliuk of Ohio State University, Columbus, Ohio were elected corresponding members. Under the

head of program the following were presented:

THE USES OF INSECT GALLS.

By Margaret M. Fagan, 1

A CONTRIBUTION TO THE BIOLOGY OF N. A. DIPTERA.

BY CHARLES T. GREENE,

Forest Insect Investigations, Bureau of Entomology.

The Diptera discussed in this paper was reared by the writer at the Eastern Field Station, Falls Church, Va. All the species discussed below remain in the larval stage during the winter. The larva of *Mydas clavatus* and *Dasyllis thoracica* are predaceous on Coleopterous larvae, therefore they are of importance. The larva of Dasyllis is a secondary wood-borer in addition to being predatory. All of the above species are known in the adult stage but their seasonal history and habits are entirely new.

Neopachygaster maculicornis Hine.

Ohio Naturalist, H. p. 228.

The larvae were collected at Falls Church, Va., November 29, 1912, by the author. They were found under the bark of Tulip (*Liriodendron*) in the sap, on the moist surface between the outer wood and bark. The exact time of pupation is not known but is sometime in early spring. The adults emerged between May 23 and June 3, 1913.

Larva (plate XVII, fig. 4).

Larva.—Grayish-brown, flattened and somewhat chitinous. The entire surface of the larva, except the head, is marked in a very minute way,

¹ Withdrawn for publication elsewhere.

resembling the scales of a snake skin. The dorsal and ventral bristles are yellowish-brown and the ventral bristles are located about like those on the dorsum.

Head: The head resembles a beak, much darker at the apex; along the entire vertical length of the dorsum of the head, is a broadly rounded ridge terminating into a sharp point.

On each side of the anal opening are three bristles, in a vertical row, and a single bristle, near the base of the segment which is located between this row and the lateral edge.

For general details see the drawing.

$$Pupa\ (fig.\ 4)$$
.

Pupation takes place in the larval skin and the pupa looks identical with the larva; the only difference is, the flexible skin along the segmental lines becomes rigid. The adult emerges by pushing off the head and splitting the first two segments down the middle of the dorsum.

Mydas clavatus Drury.

Illustrations of Nat. Hist., I. p. 103.

The larvae of this species were collected at Falls Church, Va. by Mr. T. E. Snyder and the author, in the rotten roots of a dead tulip stump. All the larvae were well below the ground, where the wood was quite moist; they resembled the wood fibres so closely that they might often be overlooked. The larvae are predaceous on Coleopterous larvae and one larva devoured an earth worm, placed in the breeding jar. In the same roots were several larvae of the following Coleopterous genera, Alaus, Parandra and Pelagnota.

Only one larva pupated, June 1, 1914 and the adult emerged June 27, 1914.

Larva (plate XVII, fig. 1).

The larva is 40 mm, long and little over 6 mm, wide, nearly cylindrical. Smooth, opaque, ivory white.

The beak is 1.5 to 2 mm, long, when extended, heavily chitinized and of a dark brown color. It is retractile into the first segment. The beak is split in the center of the apical half. On the dorsal side are three pairs of yellowish-brown, proclinate, bristles; the middle pair are the smaller and are sometimes divaricate and the posterior pair are the larger. Sides of the larger are parallel, tapering to a point from the third to the first segment.

The first segment has two faint longitudinal grooves near the middle and one near each lateral edge, on the dorsum and the venter. All the other segments have the lateral grooves which form the following ridge: on the sides of all the segments, and the entire length of each, is a broad ridge, broadly rounded. This ridge is only on the basal half of the last segment, the sides of the apieal half are broad at the base and terminate into a sharp edge or carina at the apex. At the base of the first segment, near the outer corners, are two small, yellowish brown spiracles, which are elliptical, chitinous plates with three, parallel, oblique slits which are darker on the edges and point towards the apical corners of the first segment.

Near the apex of the lateral ridge, is a microscopic spiracle on all segments except the first, second and last.

The last segment is nearly twice as long as the preceding ones and terminates into a blunt point. In the middle of the dorsum of the last segment are two transverse grooves or folds which are interconnected by two smaller folds, which are oblique and slightly curved. From these transverse grooves are two longitudinal, faint grooves which are irregular and terminate at the apex of the last segment.

The last segment has two much larger spiracles, located near each basal corner. Each spiracle is nearly circular and are much darker yellowish-brown than the anterior pair. Around the edge of each is a band or border composed of 40 compressed ringlets, resembling a cross-section of grains of corn. The area inside of this band is pale grayish brown. Below the upper edge, which is towards the cephalic end of the larva, is a crenulate opening reaching half way around this area. See plate xvii, fig. 3.

The under side of the head has two pairs of proclinate bristles, one pair at the base and the other at the middle.

Segments one, two and three each have one pair of yellowish-brown bristles on the ventral side. Each bristle is located in the middle of the segment and about one-fourth the transverse width from the lateral edge.

The ventral side of the last segment has a pair of yellowish-brown bristles near the apex and a pair on the lateral edge located at about the apical fourth. At the base of this segment is a groove which forms a rectangular surface with a slight depression near each end. From this rectangular surface are two grooves running parallel, half way to the apex, then converging to a point at the apex.

The anal opening is located at the base of this last mentioned surface.

Pupa (plate XVII, fig. 2).

The pupa is 25 mm, long and 6 mm, diameter at the base of the abdomen; thorax nearly 7 mm, diameter.

Head and thorax are dark reddish-brown. Abdomen much lighter and of a brick-red color. The whole pupa is rugose, the abdomen is more sharply marked, especially along the apical edge of the segments, where it is reticulate.

Head.—Near the apex are two large horn-like projections. Below are two more projections, each having one large and one small tooth or prong. In back of and slightly below each apical projection, is a bifid humeral spiracle, opening on the caudal side. The ends are bifurcate, shiny and

finely serrated on the edges. In general this spiracle resembles a "ram's horn." The wing-pads reach to about the middle of the second abdominal segment and the leg-sheaths slightly beyond the pads. Near the base of each wing-pad is a rugose tubercle, terminating into a chitinous, pointed tooth.

Abdomen.—Along the basal edge of the first segment is a row of large tooth-like, dark brown spines with the points turning backward. Each of the end spines are much smaller than the others. On the sides of the first segment, close to the apical edge, is a row of spines, reaching from the lateral edge of the dorsum to the wing-pads. All the other segments, except the last, have a transverse row of prominent spines near the apex encircling the segment, the spines on the dorsum are the larger. The last segment has two pairs of very small spines on the dorsum, near the base. On each side are three larger spines near the middle and transversely across the middle of the venter are four spines. This segment terminates into two very large horn-like spines. All the spines on the pupa are shiny, heavily chitinized and quite dark on the apical half, the basal portion is rugose and of the same color as the pupal skin.

On the side of all the segments, except the last, is a ridge which is broad and slightly rounded, extending the longitudinal length of each segment. Above and slightly in front of the center of each ridge, is a spiracle like the humeral one but lighter in color and opening on the cephalic side.

The adult emerges from the pupa through a longitudinal, dorsal slit in the thorax and the bursting of the sutures around the head.

Dasyllis thoracica Fabr.

Syst. Antl., p. 158.

This species is predaceous in the larval stage and a secondary wood-borer, in moist dead, Tulip stumps. It closely resembles a Coleopterous larva and is easily overlooked because it closely resembles the wood fibre, in which it lives. The larvae were collected at Falls Church, Va., April 10, 1914, by Mr. S. A. Rohwer and the writer.

They pupated April 21, 1914 and emerged May 11, 1914. Under natural conditions, the larva pupates in the gallery, and the pupa is fairly active.

Larva (plate XVIII, fig. 1).

Larva.—Opaque, white, elongate and cylindrical. The entire larva longitudinally striate. The greatest width of the larva is across the second segment; other segments nearly parallel. The larva is 27 mm. long and 5.5 mm, wide across the second segment, while the other segments are nearly 5 mm, wide.

The head is very heavily chitinized and black with the basal corners reddish. From a dorsal view the head is divided into three parts. The basal part reaches the full width of the head; it is deeply concave on the apical edge, in the middle of which is a long, slender, tooth-like projection extending up between the two upper sections. Each of these sections are somewhat triangular in shape; the inner side terminates into a tooth-like projection at the apex and below this, on the outer edge, is a similar projection. The antennae are located near the basal outer edge of this last mentioned projection. The antennae have two cylindrical joints of nearly equal length, the first joint is reddish-brown at the base and yellowish at the apex, while the coloring of the second joint is the reverse. All the bristles of the head are pale yellow.

For details of head see drawing, figure 5 dorsal view and figure 4, ventral view.

First segment rather broad and rounded. At the apex is an elliptical area finely granulated, being much finer at the base. Just below this is a perfectly smooth, narrow, transverse band, not quite reaching the lateral edges. The second segment is about half the width of the first, along the apical edge is a narrow transverse space which is very finely rugose. The third segment is very narrow, being about half the width of the second segment. Near the apical edge are two rather sharp transverse wrinkles slightly depressed or flattened in the middle. Segments four to ten are about the same width. Segments four to nine, each have one pair of ampullae on the dorsum and two pairs on the ventral side. The last segment is deeply depressed on the basal half, faintly rugose and with two well defined lengitudinal ridges on the lateral edge. Towards each outer edge is a large spiracle, dark yellowish-brown and rather heavily chitinized. For further details see figure 1. The apical half of this segment is raised much higher than the basal half, slightly rugose and terminates into a broad and narrow, reddish, chitinous plate, black on the outer edge, in the center of which is a prominent, black, tooth-like projection. This chitinous plate has a large, yellowish bristle extending from the under side near both of the outer corners. Near the middle of the last segment, on the elevated portion, are four large vellowish bristles, in a transverse row.

The details of the under side of the head can best be seen in the drawing, figure 4. All the dark portion is heavily chitinized and black, the dark area in the central, basal part is reddish on the apical edge. The bristles are yellowish.

On the apical edge of the ventral side of the first segment is a narrow crescent-shaped area finely granular. Segments one to nine each have a yellow bristle, near the middle and out near the lateral edge.

At the apex of the last segment, on the ventral side, near each outer basal corner is a yellow bristle. At the base of this segment are several, short, well marked ridges.

On the side of the first segment, near the base is a spiracle, nearly circular having three faint ridges on the cephalic side, just below these is an opening which is pit-like in appearance. It is dark brown, chitinous and faintly granular, located in a small depression in the larva. For details see drawing, figure a.

On the side of segments three to nine, and located at about the apical third, is a small, round, flattened spiracle, with one faint slit across the middle.

The PREPUPAL larva is white and of about the same size and appearance as the larva. There is a great shrinkage of the first segment and from a side view the dorsum of this segment is concave.

The humeral spiracle is formed slightly in front of and above the large anterior spiracle of the larva, and all the lateral, abdominal spiracles are formed in front of and below those of the larva. All the abdominal spines and bristles are pale yellow and perfectly formed under and show through the semi-transparent larval skin. The large pointed horn-like projections at the apex of the abdomen project slightly through the skin and are of the darkened, nearly normal coloring.

Pupa (plate XVIII, fig. 2).

The pupa is elongate, cylindrical, moderately shiny and faintly rugose. The general color is pale yellow ochre. It measures 20 mm, in length and 5 mm, in width at the thorax while the abdomen is slightly narrower.

Head.—On each side of the apex is a large, pointed, horn-like projection, below each of these, on the side, is a larger one with three large prongs, the last one having two small points at the apex.

These large projections are deep reddish-brown, very rugose at the base and smooth and shiny on the apical half. In back of the above projection is a small, sharp pointed, tooth-like projection, yellow at the base and reddish-brown at apex; near the middle of the upper side is a small ridge reaching to the apex.

Thorax.—Near the base of the first abdominal segment, across the middle of the next four segments and at the apex of the last segment, yellowish brown.

The humeral spiracle is small, reniform, pale yellow, smooth and slightly raised, with a row of uniform dark dots around the curved edge. (See drawing, plate XVIII, fig. b.) On the upper edge of the wing-pad is a rounded, raised surface, with a small, narrow, darkened, sharp edge just back of the center. At the lower edge of the pleura and touching the wing-pad is a foot-like projection, which is reddish-brown towards the apex where there are two small, tooth-like points and one large point near the base.

The wing-pads reach to the middle of the second abdominal segment and the leg-sheaths to the middle of the third segment.

Abdomen.—There are eight well defined segments. All but the last have a transverse row of sharp, claw-like dark-brown spines across the dorsum of the segments, becoming quite long and yellow on the sides of the segments and diminishing in length on the venter. These ventral bristles increase in length, on each segment, as they near the last segment. For the location of these spines and bristles see drawing (fig. 2).

At the apex of the abdomen are four large, very rugose, reddish-brown, chitinous tooth-like spurs; between the lower pair on the dorsum, are two

small, rounded, brown tubercles. Below these tubercles, on the dorsum is a small, rounded, frosted area.

About half way between this area and the base of the segment, is a large, sharp, elaw-like, dark spine; at the base of this is a smaller, dark spine with two points at the apex. Between these spines and the segmental line is another sharp spine, near the base of which is a small, rounded, roughened, dark spot, which is the remains of the large posterior spiracle.

On the ventral side of the last segment are two very large tubercles, semi-transparent and darkened on the inner edge to the apex.

The under side of the thorax has two short, robust, claw-like spines, bifurcated at the apex and each having a short yellow spine, near the middle of the inner side. These spines are yellow with a reddish-brown edge.

On the side of all the segments, except the last, and close to the cephalic edge, is a reniform spiracle, it is like the humeral one except the curved side is on the opposite side.

The adult emerges through a longitudinal, dorsal slit, in the thorax and bursting of the sutures of the head.

Criorhina (Somula) decora Macq.

Dipt. Exot., Suppl. II, p. 57.

The larvae¹ of this species were taken from a pocket in a living Tulip tree, by the writer, at Falls Church, Va., November 29, 1912. This pocket was filled with black frass, composed of dead vegetation and moistened with rain water and sap from the tree. Pupation took place in the larval skin, from April 8, to 18, 1913. The adults emerged from April 17 to May 1, 1913. All emerged during the night.

Egg.

On May 13, 1915, a female of this species was observed during oviposition. There was a large living tree with a small pocket near the ground, which was filled with frass-composed of decayed leaves, etc., and rather moist with the sap. The fly flew around this tree several times, making a loud humming sound, and then alighted on the moist frass. After walking around on this frass for a few seconds, with the abdomen moving up and down, the fly stood still for a few seconds, with the tip of the abdomen touching the frass. Suddenly a tiny white egg appeared. This performance was repeated before the disposition of each egg and

¹ Twice during the winter these larvae were frozen. Ordinarily they are opaque but when frozen they were transparent and colorless. Shortly after thawing, and returning to the opaque, all 14 larvae pupated. From these 13 adults emerged.

after laying two or three eggs the fly would leave the pocket and encircle the tree a few more times, then return and repeat the above habit. The eggs were left exposed. The fly was nearly two hours depositing twelve eggs.

The egg is opaque, white, cylindrical and tapering slightly towards each end. The surface is very faintly reticulate. It is 0.75 mm, in length and the diameter is equal to half the length.

Larva (plate XVIII, fig. 1).

This larva is a typical rat-tail type. Body elongate, elliptical, and very rugose transversely. It is opaque, grayish-yellow with a little white showing through. The tail is grayish-brown and darker than the body. The body is completely covered with a fine, pale yellow pubescence which is longer on the lateral edges. Cephalic end rounded. Caudal end tapers down to the rat-tail which is cylindrical. A narrow area across the front of the head, is beset with minute spines which are pale yellow at the base and dark yellowish-brown at the apex. The dorsum of the first segment has seven longitudinal, faintly impressed grooves, the end grooves are the smaller. At the base of the second groove is a small, tubercular, chitinous, dark brown spiracle, opening on the outside.

The tail is very slightly larger at the base than at the apex; the sides being almost parallel. On the lateral edge at the base of the tail, is a tubercle with a tuft of long yellow pubescence at the apex. Just below this tubercle is a similar, but smaller one. On each side of the apical end of the tail is a very small, transparent, colorless, cylindrical projection, terminating into a hair-like projection. The tail is composed of three sections; the apical and middle sections are retractile into the basal one. The apical section is somewhat chitinous, especially at the apex.

The mouth parts (fig. a) are entirely suctorial. The buccal cavity is darkened on its edges and is located just beneath the apex and between two large, rounded, fleshy folds. Just above the edge of the buccal cavity are the antennæ; they are white and form one solid trunk at the base which is bifurcate on the apical half. Each half is divided at the apex, appearing like two small, yellow, chitinous thimbles. The inner one has a small tubercle at the apex (fig. b).

When disturbed, the antennae are drawn into the buccal eavity.

Just below the buccal eavity is a pair of ampullae, the next segment does not have any, the following six segments each have a pair. Each ampulla has a number of yellowish-brown bristles, hooked outwardly on the end; and are located near the apex.

The larvae when full grown, average, in the body, 12 to 15 mm, in length and 5 mm, in width, and nearly cylindrical. The tail is 5 to 6 mm, long, 1 mm, diameter at the base and tapering slightly towards the apex. When the tail is fully extended it reaches about 19 mm, in length.

Pupa (fig. 2).

Same general shape as the larva, but more cylindrical and smooth. It is dark yellowish-brown and sparsely covered with a short, yellow pubescence. They average 11 mm, in length and 4.3 mm, in diameter.

On the dorsum near the apex are two very small tubercular, dark-brown, chitinous spiracles. Behind this pair is another much larger pair with the apical portion bent back. They are more yellowish than the pupa skin, and slightly shiny.

From the dorsal aspect, this spiracle has seven small, raised, pad-like areas which are evanescent on the ventral portion. These areas and the ventral side are covered with minute tubercles. (See fig. c.)

The tail is bent along the side of the body or up over the dorsum. The chitinous tip of the third section protrudes from the tip of the first.

Brachyopa vacua O. S.

Bull. Buff. Soc. Nat. Hist., III, p. 68.

The larvae were collected at Falls Church, Va., November 30 to December 2, 1912, by the writer. They were found under dead bark (Liriodendron) in the juice of decaying fungi. Some of the larvae were brown and some black. The juice of the fungi was brown in some places and black in others and the larva was of the same color as the juice in which it was found. A larva of each color was isolated and the result was a ♂ in each case.

Exact time of pupation not known. All the adults emerged during the night, from April 5 to 14, 1913.

$Larva^1$

Larva.—Opaque, dull, light yellow-ochre with the entire body finely rugose. First segment somewhat pointed. Larva reaches its greatest width at the fourth segment and gradually decreases in width towards the caudal end. The dorsum is very rugose transversely; in the middle of each segment is a transverse depression or groove. On the lateral edge, near the apex of the first segment, is a small spiracle. It is conical in shape, of a dark reddish-brown color and of a chitinous texture. On the dorsum of the first segment are six faint, longitudinal ridges reaching almost to the apex, also a transverse row of six fleshy tubercles near its base and all the other segments have a row of 8 or 10 similar tubercles, just above the center. Two or three tubercles on each end of each transverse row, terminate into three or four fleshy, bristle-like projections; while the other tubercles terminate into two such projections.

At the base of the first, and the base and apex of all the other segments, is a row of short, fleshy, bristle-like projections.

¹ The larva and pupa look so much alike, that only the pupa was drawn.

At the base of the first segment is a row of small, fleshy, bristle-like projections; all the other segments have three rows each of similar projections.

Between the large tubercles on the lateral edge (which are the ends of the transverse rows) are numerous fleshy, bristle-like projections, which are longer than those on the dorsum.

The caudal or posterior spiracle is nearly cylindrical, mostly dull black and shiny at the apex. On the apex are two small, circular, pit-like openings.

The mouth is a fleshy opening, of the suctorial type and retractile between two large, rounded, fleshy folds.

The palpi are located just above the buccal opening and are retractile. The base is whitish and nearly cylindrical and bifurcated at the apex; these bifurcations are yellowish-brown and have a depression or groove on both sides, giving this upper portion the appearance of two cylinders fused together; the inner cylinder slightly shorter than the outer one.

For details see drawing (fig. d).

The entire ventral surface of the larva is covered with minute, brownishblack spines.

Larva is 7 mm. long in the body, posterior spiracle 1 mm. making a total of 8 mm. in length and 3 mm. wide, being nearly cylindrical.

Pupation takes place in the larval skin. The puparium looks like the larva except the characters noted. It is much smoother and the segmentation is hardly noticeable. All the fleshy, bristle-like projections are very much compressed and shriveled. In profile, the puparium slopes from about the middle of the second segment to the apex of the first, having a wedge-shape appearance. On the dorsum of the first segment are four short ridges, all meeting at the apex. Near the center of the transverse ridge, in the middle of the second segment, are two conical spiracles, curved outward; they are reddish-brown, slightly shiny at the apex, and have numerous small tubercles, around the sides with one located at the apex.

It is 7 mm, in length, 4.75 mm, in width and nearly cylindrical. The adult emerges by pushing off the dorso, apical portion of the puparium which breaks transversely across the segmental line.

Pseudotephritis corticalis Loew.

Mon. N. A. Dipt. III, p. 136.

These larvae were collected at Falls Church, Va., February 18, 1913 by Messrs. S. A. Rohwer and Wm. Middleton, in frass, under the bark of chestnut (*Castanca dentata*).

Pupation took place in the larval skin, March 16, 1913 and the adults emerged April 16 to 18, 1913.

Larva (plate XX, fig. 2).

Larva.—It has eleven segments, is opaque white, very faintly yellowish at the base of the segments, cylindrical and tapering to a point at the head. They vary from 3 to 6 mm. in length and 1 to 1.5 mm. in diameter.

The head is retractile into the first segment, is bilobed and each lobe has a very minute tubercle at the apex and on the under side of each lobe is a series of brownish, roughened, transverse lines. Between these lobes are two dark reddish hooklets.

The anterior spiracles are white, quite small, semi-circular and beaded along the edge; in some specimens the beads are round, while in other specimens they are rounded at the top and pointed at the base; there are ten of these beads to each spiracle. This spiracle is located on the side and at the base of the first segment. Along the lower front edge of the first segment is a narrow roughened area (fig. a).

Segments four to ten each have a small, ventral fusiform area, on the front edge, which is formed by a series of raised, roughened brown lines.

On the under side of the last segment, near the middle or anal area, is a large, rugose area which is somewhat semi-circular in form. There is a very small depression on each side of the anal opening.

The last segment has a shiny, faintly yellowish rectangular depression on the end. Near the middle of this depression are two yellowish-brown, button-shaped, raised, spiracles which vary from nearly round to elliptical. On each of these chitinized plates are three oblique slits. Just above these slits is a small impression like an asterisk, which is concolorous with the larva. The two stigmal plates are separated by a small Y-shaped depression (fig. b).

Pupa (fig. 3).

The pupa is brownish-yellow, cylindrical, tapering slightly towards the head where the color is a deeper brown. It is 4.5 mm. in length and 1.25 mm. in diameter. The entire pupa skin is sharply marked with very narrow, transverse ridges. All the transverse, segmental lines of the larva are visible on the pupa skin, where they appear as very fine rugose surfaces. The end of the last segment has a sharp edge or carina around it forming somewhat of a hexagon; in this hexagonal area are the posterior spiracles which are like those of the larva with the addition of a small stem on the inner side, which points upward and outward.

The adult emerges by splitting the puparium and forcing its way through this slit.

PLATE XVII.

- Fig. 1. Mydas clavatus Drury, larva.
- Fig. 2. Mydas clavatus Drury, pupa.
- Fig. 3. Mydas clavatus Drury, posterior spiracle, enlarged.
- Fig. 4. Neopachygaster maculicornis Hine, larva.

PLATE XVIII.

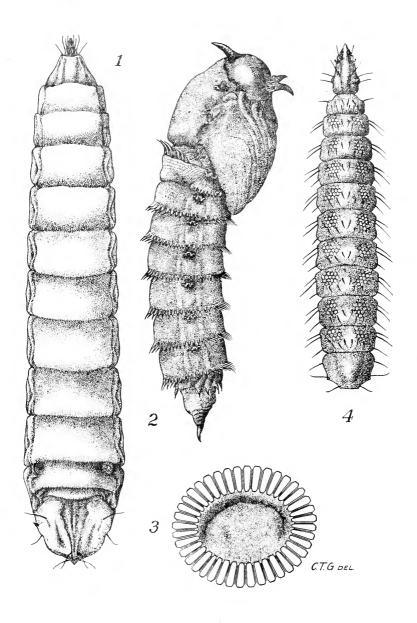
- Figl 1. Dasyllis thoracica Fabr., larva.
- Fig. a. Dasyllis thoracica, anterior spiracle.
- Fig. 2. Dasyllis thoracica, pupa.
- Fig. b. Dasyllis thoracica, lateral spiracle of pupa.
- Fig. 3. Dasyllis thoracica, pupa, lateral view.
- Fig. 4. Dasyllis thoracica, mouth parts, ventral view.
- Fig. 5. Dasyllis thoraciea, mouth parts, dorsal view.

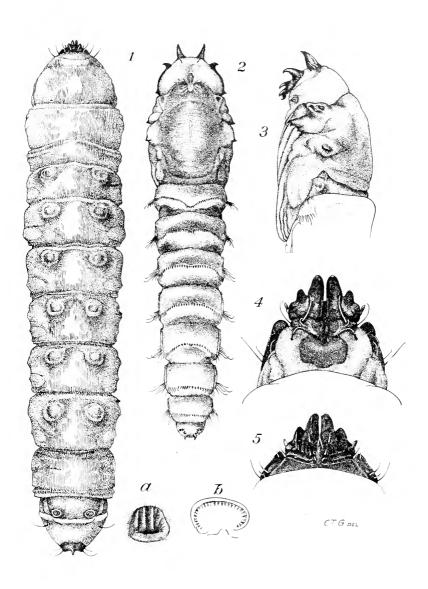
PLATE XIX.

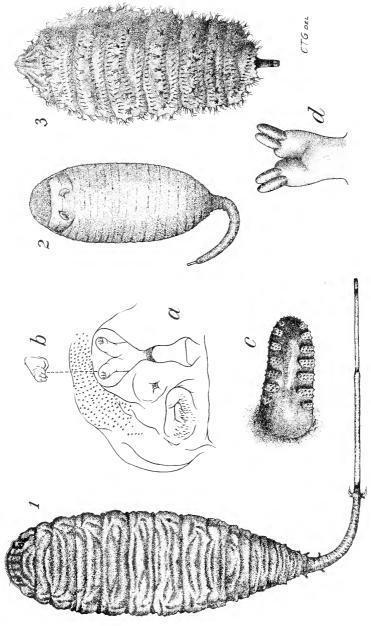
- Fig. 1. Criorhina (Somula) decora Macq., larva.
- Fig. a. Criorhina (Somula) decora, mouth parts.
- Fig. b. Criorhina (Somula) decora, antennæ, enlarged.
- Fig. 2. Criorhina (Somula), decora pupa.
- Fig. c. Criorhina (Somula), decora spiracle enlarged.
- Fig. 3. Brachyopa vacua O. S., pupa.
- Fig. d. Brachyopa vacua, antenna.

PLATE XX.

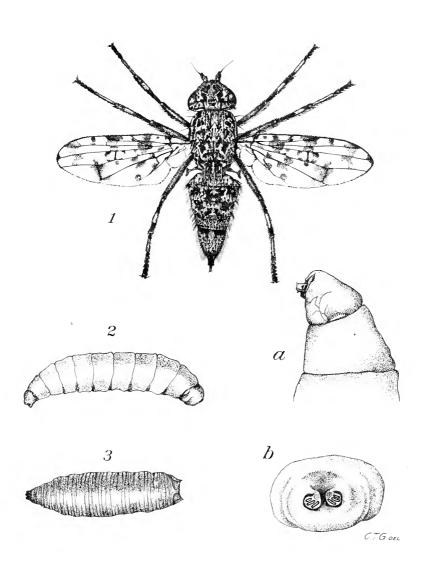
- Fig. 1. Pseudotephritis corticalis Loew, adult.
- Fig. 2. Pseudotephritis corticalis, larva, lateral view.
- Fig. a. Pseudotephritis corticalis, larva, lateral view of head.
- Fig. b. Pseudotephritis corticalis, larva, end view.
- Fig. 3. Pseudotephritis corticalis, pupa.







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A MUCH DESCRIBED ICHNEUMONID AND ITS SYSTEMATIC POSITION.

By R. A. Cushman,

Bureau of Entomology.1

The difficulties of the student of the Ichneumonidae are well demonstrated by the vicissitudes through which the species discussed below has passed.

In 1868 Cresson described, from the male only, his Mesoleptus (?) muliebris.

In 1875 Provancher described, from the female, Mesostenus rufipes, which, in 1879, he transferred to the genus Mesoleptus.

In 1880 Provancher described, from the female, Echthrus pediculatus, and, in 1886, Mesostenus pleuricinctus, also from the female.

In 1894, Davis, who had examined a large number of the Provancher types, synonymized Mesoleptus rufipes Provancher and Echthrus pediculatus Provancher, which latter he doubtfully

referred to the genus Euxorides Cresson.

In 1895, Davis, after having examined more of the Provancher types, added Mesostenus pleurieinctus Provancher to the above synonymy, and stated that "they are all, with very little doubt, synonyms of Cresson's Mesoleptus (?) muliebris, which is the male.' In this paper Davis, considering the species more likely cryptine than tryphonine or pimpline, referred it, because of the lunulae, to the tribe Phaeogenini, evidently considered by him cryptine rather than ichneumonine, and placed it in Foerster's genus Diacritus, thereby making it the genotype of Diacritus Foerster.

Dalla Torre adopted Davis' synonymy and generic conclusions, and Viereck gives as the genotype of Diacritus, Mesostenus rufipes

Provancher.

Since the publication of Davis' synonymy this species has been again described, this time by Viereck under the name Pleetiscidea (Aperileptus?) contentionis,

In 1875 Provancher described from the male his Mesoleptus variabilis, which he later (1879) synonymized with muliebris But, as will be shown later, this synonymy is incorrect.

Mr. S. A. Rohwer has recently examined the Provancher types, and there is in the National Museum a specimen of this species which is a Rohwer homotype of all of Provancher's species except, of course, variabilis. At the time he examined the types Mr. Rohwer was of the opinion that rariabilis Provancher can not be the male of the present species, but that it is a mesoleptine.

¹ Published by permission of the Secretary of Agriculture.

the Mesoleptini, his notes state, it runs in Davis' key to Zemiodes Foerster or Clepsiporthus Foerster, but is apparently neither of the species listed thereunder.

In 1882 Provancher again used the name Mesoleptus variabilis, this time for another species, which Mr. Rohwer is of the opinion is the same as Euryproctus sentiris Davis. In arriving at this conclusion Mr. Rohwer ran the Provancher type in Davis' key to the Mesoleptini and compared it with the original description of E. sentiris. Provancher's name, being preoccupied in Mesoleptus, will, if it is the same as E. sentiris, have to give way to Davis' name and the species be known as Euryproctus sentiris Davis.

In the National Museum is a specimen from Meklenburg, Germany, labelled *Phidias àciculatus* Vollenhoven, genotype of *Phidias* Vollenhoven, which specimen is congeneric with the species under discussion. If this specimen is correctly determined, which appears doubtful, *Phidias* Vollenhoven must fall as a synonnym of *Diacritus* Foerster (Davis). I have not seen the genotype of *Plectiscidea* Viereck, but if his *P. contentionis* is correctly referred to the genus it too must be synonymous with *Diacritus*.

As for the systematic position of *Diacritus*, it can certainly not be left, where Foerster placed it, in the Phaeogenini. Practically the only way in which it resembles the other genera of that tribe is in the possession of lunulae on the tergites, and it is most certain that the species on which Foerster based his genus is not congeneric with the genotype. The genus, however, must follow its type species, and it is the opinion of the writer that the more prominent characteristics of the genus, especially the very narrow first abdominal segment with its prominent spiracles, ally it more closely with certain genera in the Plectiscini than with any other group. In Foerster's key to his family Plectiscoidae it runs d'rectly to *Blapticus* Foerster, but differs markedly from the description of that genus. If its possession of an arcolet is ignored it runs to *Entelechia* Foerster, and, from the description of that genus, is evidently rather closely allied to it.

Genus Diacritus Foerster (Davis).

Head broader than thorax; eyes large, nearly parallel within; temples strongly sloping; occipital carina strong; malar space somewhat shorter than basal width of mandible; face much wider than long, slightly elevated in middle; clypeus separated, weakly convex, much broader than long, subtruncate at apex; antenae nearly as long as body, first joint of flagellum very long, much longer than second, apical joint in female large, twice as long as penultimate, in male, flagellum tapering toward apex; notauli deep, meeting on disk of mesoscutum, prescutum gibbous; prepectal carina very strong and complete; propodeum longer than combined height of propo-

deum and metapleura, all longitudinal carinae but only apical transverse carina present, latter very strong and very close to apex, petiolar area very short; spiracle very near base; legs long, slender, hind basitarsus nearly as long as rest of joints combined; wings large, reaching to apex of abdomen, areolet oblique quadrangular, first abseissa of radius straight, second decurved; stigma lanecolate, radius originating in middle; nervellus broken below middle, brachiella more or less developed; abdomen petiolate, first tergite very narrow, nearly cylindrical, barely wider at apex than at base, slightly decurved, spiracles prominent, slightly before middle; tergites beyond first in female suddenly much wider, in male gradually wider, 2–4 with distinct lumulae and 2 with large thyridia; ovipositor nearly as long as body, compressed.

Type.—Diacritus muliebris (Cresson).

Diacritus muliebris (Cresson).

Mesoleptus (?) muliebris Cresson, Trans. Am. Ent. Soc., II, 1868, p. 102, ♂. Mesostenus rufipes Provancher, Nat. Can., VII, 1875, p. 263, ♀.

Mesoleptus rufipes Provancher, Nat. Can., XI, 1879, p. 226.

Echthrus pediculatus Provancher, Nat. Can., XII, 1880, p. 99, Q.

Mesostenus pleuricinetus Provancher, Addit. Faun. Ent. Can., Hym., 1886, p. 76, φ .

Euxorides (?) pediculatus Provancher, Davis, Proc. Ac. Nat. Sci. Phil., 1894, pp. 184-190.

Diacritus rufipes Provancher, Davis, Can. Ent., XXVII, 1895, pp. 288-289 (=? Mesoleptus muliebris Cresson).

Diacritus rufipes Provaneher, Dalla Torre, Cat. Hym., III, 1902, p. 770 (=? Mesoleptus muliebris Cresson,) (=? Mesoleptus variabilis Provancher, 1875 not 1882).

Diacritus rufipes Provancher, Viereck, Bul. 83, U. S. Nat. Mus., 1914. p. 43.
Plectiscidea (Aperileptus?) contentionis Viereck, Conn. State Geol. & Nat. Hist. Survey, Bul. 22, part III, 1916, p. 276, ♀.

A review of the above synonymy shows that the species has been described under five specific names, and referred to six genera representing five tribes and, including the original placing of *Diacritus*, all five of the subfamilies of the Ichneumonidæ.

Description from types of Cresson and Viereck species, Rohwer homotype of Provancher species, and other material of both sexes.

Female.—Length 7 mm.; antennae 6 mm.; ovipositor 3 mm. Head and thorax, except metapleura and propodeum, polished, nearly without sculpture; face about two-thirds as long as wide, obscurely shagreened but shining; elypeus nearly twice as broad as long; malar space two-thirds as long as basal width of mandible; metapleura and propodeum, except petiolar area, roughly coriaceous, petiolar area polished; abdomen, including first tergite shagreened, subpolished apically; first tergite without dorsal cari-

nae, but with strong lateral earinae from base to spiracle and from spiracle to apex.

Black, with whitish to yellowish markings as follows: mandibles, palpi, apex of clypeus, antennal insertions, scape and pedicel beneath, pronotum anteriorly, propleura largely, front and middle coxae and trochanters, hind trochanters below, tegulae, spot below, scutellum and post scutellum, tergal sutures, and apical tergite; antennae brown; legs testaceous, hind tibiae and tarsi fuseous; wings hyaline.

Male.—Differs from female principally in color, the markings being paler and embracing the entire face, cheeks, entire ventral surface of thorax except metasternum, extending up nearly to dorsal margin of mesopleura, ventral surface of all legs except tarsi, a central spot on mesoscutum, occasionally a small spot on each side of presentum, more or less obscure spots laterally on propodeum, and much broader bands on abdomen.

Zemiodes (?) variabilis (Provancher).

Mesoleptus variabilis Provancher, Nat. Can., VII, 1875, p. 115, (not 1882). Mesoleptus muliebris Cresson, Provancher, Nat. Can., XI, 1879, p. 227.

Provancher synonymized these two, but the synonymy is incorrect.

Euryproctus sentiris Davis.

Mesoleptus variabilis Provancher, Nat. Can., XIV, 1882, p. 7. (not 1875).
Mesoleptus provancheri, new name for variabilis Provancher, 1882 not 1875.
Euryproctus sentiris Davis, Trans. Am. Ent. Soc., XXIV, 1897, p. 330.

NEW HYMENOPTERA.

By J. C. Crawford.

Hesperapis Ckll.

Professor Cockerell has recently (Psyche, XXIII, 176–178, 1916) published on the synonymy of this group, and at present it seems best to treat *Zacesta* and *Panurgomyia* as synomyms of this genus. *Z. rufipes* is very similar to the genotype of *Hesperapis* and is probably the male of a very closely allied species. *Panurgomyia fuchsi* belongs to the group of *H. cumorpha* and (*Panurgus*) *H. regularis* Cress. and is very close to *regularis*. The type of *fuchsi* is in bad condition and the identification is, therefore, somewhat uncertain.

The following table will separate the males of the group of *rhodocerata* and allies, that is those in which the propodeal triangle is not closely punctured but mostly smooth.

1.	Wings perfectly clear larreae Ckll.
	Wings not perfectly clear
2.	Inner orbits parallel laticeps n. sp.
	Inner orbits converging below
3.	Apex of wings whitish
	Apex of wings not whitish
4.	Legs entirely fulvous
	Legs mostly dark
5.	Tarsi and spot on tegulae reddish; veins light brown rhodocerata Ckll.
	Tarsi and tegulae black; veins almost blackarenicola n. sp.

Hesperapis laticeps new species

Male.—Length 9 mm. Black, head broader than thorax, inner orbits parallel; vertex high; face latered of ocelli not depressed; checks at upper end of eye convex in outline; face finely sparsely punctured, surface almost concealed by the dense white pubescence; anterior margin of clypeus reddish; labrum and mandibles, except the red apical portions, honey color; tip of one mandible reaching to base of other; joints of labial palpi almost equal in length; flagellum light reddish beneath; thorax and propodeum, except triangular enclosure covered with dense white hair; mesonotum finely sparsely punctured; base of propodeal triangle finely wrinkled, the wrinkles nearest metanotum parallel to the posterior edge of that sclerite; the wrinkles beyond these broken medially and the inner ends turning caudad; rest of triangle, except apical part, finely reticulated; tegulae with a large reddish spot; wings slightly dusky; veins light brown; first cubital cell over one-third longer than second; legs brown; abdomen dark brown, closely and finely punctured with short brown pubescence, apical margins of segments 1-6 with a band of white appressed pubescence.

Type locality.—Panamint Valley, California, (April, 1891, A. Koebele coll.)

Eight specimens; type and paratypes a and b with the above record: paratypes c-g from the Panamint Mts., (April, 1891, Koebele), the latter series have evidently been in alcohol and are badly rubbed.

Type.—Cat. No. 21160 U. S. N. M.

Hesperapis fulvipes new species.

Male.—Length 11 mm. Black, with slightly ochraceous pubescenee, long and dense on thorax and very dense and almost white below antennae: face finely sparsely punctured; inner orbits distinctly converging; face laterad of ocelli concave; anterior margin of elypeus and labrum almost honey color; base of mandibles yellowish, tips ferruginous; flagellum reddish, somewhat darker above; mesoscutum with sparse small punctures, punctures of scutellum closer; propodeum smooth, extreme base indistinctly reticulated, tegulae testaceous; wings faintly dusky; stigma and

veins honey color; legs reddish, more yellowish apically; coxae darker; abdomen finely sparsely punctured with scattered ochraceous hairs and slightly ochraceous bands in segments 1-5, segment 6 almost entirely covered covered with sim lar hair; venter largely rufous.

Described from two males from San Diego County, Calif., collection Coquillett, the paratype somewhat less than 10 mm. long. Type.—Cat. No. 21161 U. S. N. M.

Hesperapis arenicola new species

Male.—Length 10 mm. Black, with ochraceous pubescence, dense on head and thorax and very dense and almost white below antennae; inner orbits distinctly converging; mandibles dark with reddish tips; face finely rather sparsely punctured; face in outline laterad of ocelli concave; cheeks in outline at top of eyes concave; first joint of labial palpi about as long as joints 2 and 3; antennae dark, obscurely reddish beneath at extreme tip; mesoscutum and scutellum rather closely and finely punctured, the punctures becoming sparse mesad; propodeum smooth, shiny, with a very short dorsal row of longitudinal rugulae; posterior face of propodeum with scattered punctures; tegulae black, wings slightly infuscated, stigma dark brown, the margins darker, veins almost black; legs black with ochraceous pubescence; abdomen with minute rather close punctures, with long scattered ochraceous hairs and apieal bands of lightly ochraceous hair on segments 1-6.

Described from seven males collected by E. A. McGregor with the record "Indio sands, Coachello Valley, Calif., March 19, 1917." Type.—Cat. No. 21162 U. S. N. M.

The specimens vary in size from about 10.5 mm. to 8.5 mm.

Epeoloides Giraud.

The genus Viereckella Swenk is a synonym and the included species are obscura Swenk and pilosula Cresson; nearcticus Ducke and ceanothina Cockerell are synonyms of pilosula.

Trachusa manni n. sp.

Male.—Length 14 mm. Black, clypeus and lateral face marks, truneate above and extending slightly above clypeus, creamy white; mandibles 3-toothed; pubescence on occiput and on dorsum of thorax deep ochraceous tinged with reddish; on front light ochraceous, below antennae almost white, on pleurae ochraceous fading into white below; clypeus with strong well separated punctures, medially longitudinally elevated but not carinate; facial quadrangle, measured from mandibles to top of eye slightly longer than wide; punctures above antennae strong, close; mesoscutum rugosopunctate; propodeum with a basal area extending onto posterior face and defined by an impunctate line, the dorsal aspect of area with punctures

separated by about a puncture width, the interstices lineolate, posterior face of area lineolate; propodeum outside of area with punctures about as on dorsal face of area; wings brownish, more so apically and along anterior margin; second recurrent ve'n interstitial; transverso-medial not exactly interstitial, the exterior margin of the vein about in line with the interior margin of the basal vein; legs black, their pubescence almost white, that on inner side of basal joint of hind tarsi strongly reddish; hind tibial spurs dark brown; abdomen with hair bands on apical margins of segments 1-5, that on segment one ochraceous, rest white; segment one closely punctured, punctures on segments 2-5 decreasing successively in abundance, most of segment 6 rugoso-punctate; sixth segment with a strongly elevated carina near apex, broadly interrupted medially and laterally extending forward almost to base of segment but with decreasing elevation; apieal margin of segment with a produced plate as broad as interruption in earing, which is smooth, slightly curved apically and with rounded corners; seventh segment with a longitudinal carina, the apex produced, deeply and broadly emarginate, the productions subtriangular in outline and somewhat reflexed.

Type locality.—Ramsey Canon, Huachuca Mts., Ariz. Type.—Cat. No. 21836, U. S. N. M.

Described from two males collected by Dr. W. M. Mann, in honor of whom it is named. Paratype in the collection of Dr. Mann.

Differs from the description of T, perdita Ckll, in its larger size, deeper color of pubescence, shorter facial quadrangle, interstitial second recurrent vein, lack of a median carina on sixth segment and presence of one on the seventh segment, etc.

Stelis manni n. sp.

Female.—Length over 11 mm. Black, robust, with yellow ornamentations as follows: lateral face marks extending almost to summit of eyes and slightly obliquely truncate above; a transverse stripe behind ocelli extending down behind eyes almost one-fourth the length of eye; lateral and anterior margins of scutum, broadly interrupted medially in front, axillae, spot on each side of scutellum, lateral margin of tubercles, a broad band on disc of segments 1-5 successively increasing in width, broadly interrupted medially and emarginate behind on segments 1-2, a minute spot on each side of segment 6; band on fifth segment covering all but depressed apical margin of segment; head and thorax with large crowded punctures; mandibles, scape, pedicel, first two joints of funicle, reflexed lateral margin of seutum, tegulae and most of tubercles, reddish; wings dark brown, second recurrent vein well beyond apex of second cubital; femora except apices black; rest of legs red, the tarsi basally more yellowish; abdomen closely punctured, punctures on sixth segment crowded and finer; depressed apical margins of segments translucent, in front of this narrowly reddish; apical half of sixth segment reddish, the margin crenulate; last ventral segment hardly surpassing last dorsal; ventral segments strongly, closely punctured, depressed apical margins translucent, preceded by a reddish band.

Type locality.—Ramsey Canon, Huachuca Mts., Arizona. Type.—Cat. No. 21837, U. S. N. M.

Described from one female taken by Dr. W. M. Mann, after whom it is named.

Differs from *S. australis* in being larger and more robust, in the crowded punctures of head and mesonotum, the yellow band back of ocelli, the translucent apical margins of abdominal segments, preceded by the reddish stripe, the close punctures of ventral segments three and four, etc. *S. australis* has the apical margin of sixth segment more toothed than crenulate but medially there is a truncate projection medially emarginate.

Halictus.

The following key can be used to separate the females of the Philippine species of *Halictus* known to me:

1.	Green taclobanensis Ckll.
	Black
2.	Tibiae yellowmanilae Str. non Ashm
	Tibiae black 3
3.	First abdominal segment with distinct strong punctures 5
	First abdominal segment impunctate or punctures microscopic 4
4.	Larger (over 8 mm.) with strong bands of appressed pubescence on
	bases of segments and on apical margins of 3 and 4manilae Ashm.
	Smaller, slender (about 6 mm.) with at most weakly indicated bands
	on margins of segmentsnesiotus n. sp.
5.	First abdominal segment sparsely punctured, the apical margin im-
	punctatephilippinensis Ashm.
	First abdominal segment including apical margin closely punctured θ
6.	Medial anterior margin of mesoscutum reflexed and carinate
	baquionis n. sp.

baguiones n. sp.

Medial anterior margin of mesoscutum not carinate. .banahaonis Ckll.

Halictus nesiotus new species.

Female.—Length about 6 mm. Black, with sparse whitish pubescence on head and thorax; face finely lineolate, clypeus with scattered large punctures; punctures on sides of face shallow, well separated; those on front finer, deeper; mesoscutum strongly lineolated and sericeous with fine punctures separated by about twice a puncture width; scutellum with a few scattered very fine punctures; propodeum without an enclosure, the base with a few rugulae not reaching apex, rest of surface finely indistinctly

lineolate; posterior face without a surrounding carina; tegulae testaceous; wings dusky; veins brown, stigma darker, first recurrent almost interstitial; second transverse cubital and veins beyond very faint; third cubital almost twice as long as second, hardly narrowed above; legs black, pubescence whitish, tinged with yellowish within, especially on basal joint of hind tarsi; inner hind spur with four teeth; abdomen smooth, polished, almost impunctate, there being very minute microscopic scattered punctures, thinly clothed with whitish pubescence, forming thin apical bands especially on segments 3 and 4; apical margins 1–4 broadly testaceous.

Type locality.—Baguio, Luzon, P. I. Type.—Cat. No. 21361 U. S. N. M.

Two females received from Col. Wirt Robinson.

Much smaller and more slender than manilae Ashm., without the abundant ochraceous pubescence of that species and without strong bands of appressed pubescence on bases of segments and on margins of 3 and 4, etc.

Halictus manilae Ashm.

Strand's description of his *luzonicus* exactly fits this species and is probably the same.

From Baguio, Luzon, three females received from Col. Wirt Robinson.

Halictus philippinensis Ashm.

A long series with the above. The propodeal enclosure in this species is peculiar since it is not the triangular enclosure of other species but is formed by the carina surrounding posterior face of propodeum and by carinae running forward from the lateral angles of this carina and it is therefore four sided, with the sides diverging anteriorly. The carina surrounding posterior face is heart shaped.

Halictus baguionis new species.

Female.—Length over 9 mm. Black, head and thorax with rather abundant long, strongly ochraceous pubescence; punctures of head strong, crowded, below antennae, rugoso-punctate, except elypeus where the punctures are coarse and sparse, becoming finer and closer at base, and the sparsely punctured supraclypeal area; lateral angles of pronotum strongly projecting, the projection forming a right angle; mesoscutum with the anterior margin medially reflexed and carinate; the area just back of this rugose; rest of mesoscutum with large strong punctures, those on disk well separated; punctures of scutellum finer; propodeum with a triangular enclosure bounded by a carina, the enclosure irregularly rugose; rest of surface of propodeum covered with pubescence (worn specimens show the posterior face rugulose and surrounded by a carina which is slightly

interrupted in the middle above); tegulae black with a reddish center and a deep testaceous margin; wings dusky, more sonapically; veins light brown, stigma darker; veins beyond second transverse cubital obsolescent second recurrent before apex of second cubital cell; third cubital cell one-third longer than second, narrowed one-half to marginal; legs black, pubesseence ochraceous, that on outer side of tibiae, especially hind, black; inner hind spur with three long teeth; abdomen closely, finely punctured, including depressed apical margins of segments; bases segments 2–5 with light ochraceous hair bands; base of first segment covered with similar pubescence.

Male.—Length about 6.5 mm. Black, without any yellow markings; very similar to female, but tagulae, veins and stigma darker; base of seventh abdominal segment forming a semicircular polished and impunctate pseudopygidium with carinate edge which conecals true apex of segment.

Type locality.—Baguio, Luzon, P. I.

Described from 15 \circ and 1 \circ received from Col. Wirt Robinson, U. S. A.

Type.—Cat. No. 21360 U. S. N. M.

Very similar in general appearance to *H. banahaonis* Ckll. from which it differs in the carinate anterior margin of the meso-scutum, the strongly projecting lateral angles of the pronotum, the coarser punctures of the mesoscutum the absence of the carinae on the propodeum, running forward from the lateral angles of the carina surrounding posterior face.

CYNIPOIDEA.

Amblynotus slossonae new species

Female.—Length 4 mm., antennae about 2.25 mm. Black, head and mesonotum finely shagreened, pronotum at sides above rugulose, the sculpture becoming finer beneath; third joint of antennae longer than scape and pedicel combined; following joints successively decreasing in length; last joint over one and one-half times as long as 12th; parapsidal furrows complete, deeply cut throughout; posteriorly twice as broad anteriorly; parapsidal areas each with a longitudinal smooth line; middle lobe anteriorly with two lines and at apex with a median clongate triangular impression; scutellum coarsely rugose, basally with two large foveae separated by a carinate ridge; mesopleurae below coarsely striate, above finely granular with a few indistinct fine striae; wings basally strongly yellowish, the apical half very slightly so; coxae black, legs brown, becoming lighter distad; apical half of fore femora and the fore tibiae yellowish; abdomen strongly compressed, shiny, apical segments sparsely finely punctured.

Described from one specimen taken on Mt. Washington, New Hampshire by Mrs. Annie Trumbell Slosson, in honor of whom it is named.

Type.—Cat. No. 21566 U. S. N. M.

This specimen was determined as A. opacus Hartig by Ashmead

and this record may have been published.

Easily separated from bilineatus Kieff by the coarsely sculptured scutellum, and the elongate depression at apex of mesoscutum. From semirugosus by the wide parapsidal furrows which are deeply impressed all their length, scutellum rugose all over, etc.

Amblynotus semirugosus new species

Female.—Length 3 mm. Black, head, mesoscutum and base of scutellum finely shagreened; antennae, except scape and pedicel, reddish; third joint of antennae longer than scape and pedicel combined, about five times as long as thick; following joints successively decreasing in length; last joint twice as long as 12th, about as long as third; parapsidal furrows posteriorly deeply impressed, narrow, on the anterior third represented only by a depression of the tegument; parapsidal areas each with a longitudinal line; middle lobe with two lines anteriorly, and a slight depression at apex medially; foveae at base of scutellum separated by a carinate ridge; apical half of scutellum coarsely rugose; carinae on propodeum curved strongly outward; wing slightly yellowish; legs light reddish; coxae black; abdomen somewhat compressed, smooth, shiny, with minute sparse punetures except on basal segment.

Described from one specimen labelled "Adiron. Mts., Axton, N. Y., June 12–22, 1901, A. D. MacG[illivray] and C. O. [Houghton]."

Type.—No. 21567 U. S. N. M.

Differs from the description of bilineatus Kieff. in the much longer third antennal joint, the scutellum rugose apically, the carinae on propodeum not parallel, etc.

THREE HUNDRED AND FIFTH MEETING, JUNE 7, 1917.

The 305th meeting of the Society was entertained by the members of the Society from the Branch of Deciduous Fruit Insect Investigations, at the Saengerbund Hall, June 7, 1917. There were present Messrs. Barber, Boving, Craighead, Dietz, Ely, Fisher, Gahan, Greene, Heinrich, Kotinsky, McIndoo, Middleton, Paine, Rohwer, Sanford, Schwarz, Speare, Walton, and Wood, members, and Robt. Fouts, Geo. M. Greene, and E. R. Selkregg, visitors.

THE SIGNIFICANCE OF THE AUTHOR'S NAME FOLLOWING A SPECIES.

By A. B. Gahan.¹

A NEW SPECIES OF LONGHORN BEETLE INFESTING COWPEAS FROM MEXICO.²

By W. S. Fisher.

Specialist in Forest Colcoptera.

Lepturges spermophagus n. sp.

Form elongate, convex and rather robust, fuscous, rather densely elothed with short fusco-cinereous pubescence, variegated with numerous, irregular fulvous spots. Head smooth, minutely and densely punctured, clothed with rather long cinereous pubescence; front long, slightly convex, with a fine median line; vertex deeply indented. Eves moderately, coarsely granulate, large, prominent, deeply emarginate and very narrowly separated above. Antennae about two and three-fourths times as long as the body, sparsely ciliate beneath, not annulated. Prothorax trapezoidal, two times as wide as long; lateral spine rather broad and very close to base, the hind margin subtransversely, broadly and feebly sinuate from tip of the spine to the transverse median part of the base; surface even, except for a transverse subbasal impressed line of large deep punctures, densey finely punctate, and ornamented with eight irregular spots of dense fulvous, recumbent pubescence, four near the apex and four subbasal, the posterior lateral one near the base of the lateral spine, the four median ones crescent shaped, with the tips pointing outwards and forming a parallelogram. Scutellum large, truncate at apex. Elytra one and two-thirds times as long as wide, only slightly wider than prothorax, the sides nearly parallel to apical third, then rounding posteriorly to the apices, which are broadly and separately rounded; surface even, except for an indistinct costa extending from middle near base to very near the apex, punctures coarse and rather dense at base, becoming gradually finer and more obsolete towards the apex, densely clothed with short fusco-cinereous pubescence and variegated with numerous irregular spots of fulyous pubescence. Femora. tibiae and tarsi of a uniform fuscous color, clothed with cinereous pubescence; femora all clavate. Surface beneath of a uniform fuseous color, evenly and rather densely clothed with moderately long, recumbent. einereous pubescence. Coxac rather widely separated by the pro- and mesosternum, the middle ones separated by at least one-half the diameter of the coxae. Length 7 mm.; width 3 mm.

Withdrawn from publication:

² Contribution from the Branch of Forest Insects, Bureau of Entomology.

Habitat.—Tampico, Mexico. Mr. D. L. Crawford, Collector.

Type and paratypes.—Cat. No. 21423 U. S. N. M.

Described from four specimens reared March 1, 1914 from unripened seeds in the green pods of cowpeas by Mr. D. L. Crawford, which were submitted together with the work and larvae to the Museum for determination.

This species is more robust than any of our North American species and has the general form of our common Leptostylus macula Say, but the prominent lateral thoracic spine will exclude it from that genus. Our species of Lepturges, are separated into two groups on the position of the thoracic spine, and if this character is used, L. spermophagus is closely allied to L. symmetricus Hald., but the position of this spine seems to be somewhat variable. In this species the coxae are more widely separated than in any of our North American species.

This is a very interesting species on account of its habits and is the second record of a species of longhorn beetle infesting leguminous plants, the other species, *Baryssimus leguminicola* was described by Mr. Linell from a single specimen taken from a jar containing the pods of one or more species of Enterolobium, a leguminous plant from Paraguay on exhibition at the World's

Columbian Exposition at Chicago.

Mr. F. C. Craighead has supplied the following notes on the relationship of the larva of this species:

The larvae of the genus Lepturges form two distinct groups. Four species have been studied, symmetricus and signatus having three jointed maxillary palpi and a long chitinous spine on the ninth abdominal tergum; facetus and querci having two jointed maxillary palpi and no spine. This distinction is certainly of generic value as its occurence in other forms in the Lamiinae sets off well marked genera. This larvae, L. spermophagus belongs to the facetus group and can be separated from all other Lamiids by the antennal ring being closed or angulate behind; two jointed maxillary palpi; two rows of tubercules on the ampullae and no caudal spine. From facetus and quierci it can be distinguished by the more robust form and velvety pubescence on the pronotum.

NOTES ON THE LARVAE OF SOME CEPHIDAE.

BY WILLIAM MIDDLETON,

Scientific Assistant, Forest Insects, Burcau of Entomology.

This paper, which is a contribution from the branch of Forest Insects, Bureau of Entomology, is the first of a series which will deal with descriptions, notes and keys of North American Sawfly Larvae. The present paper is based on the available material of the family Cephidae and consists of descriptions of five species

representing four genera which were made in connection with the study of the wood and pith boring Chalastogastra larvae.

In the preparation of this paper the larvae of the genus *Syntexis*¹ were examined but they were in such poor condition that their position could not be ascertained. In those characters least distorted this genus approached, though did not agree with, the Xiphydriidae rather than the Cephidae.

The presence of the anal prong in the larvae of the Cephidae allies them with the Siricids while the presence of palpiform appendages on the ventral anal lobe connects them with the Pamphilids. The taxonomic position which the Cephidae should occupy, will be discussed in more detail in a later paper.

Characters common to all the genera studied and probably to

the family Cephidae:

Head.—Nearly round, mostly pale, mandibles and labrum darkened; maxilliary palpi 4 jointed; labial palpi 3 jointed, (both palpi appearing indistinctly as if terminating in a small button); antennae 4-5 jointed; mandibles 4 toothed and with a smooth, slightly curved thin blade dorsally, under the labrum, (4th or ventral tooth small and on the inner edge of the mandible); from and head generally rather sparsely spined.

Thorax.—A pair of fleshy, not jointed, mamma-like legs and a faintly yellowish, chitonized spot on the pleura, for each segment; prothorax

with a similarly chitonized area dorsally.

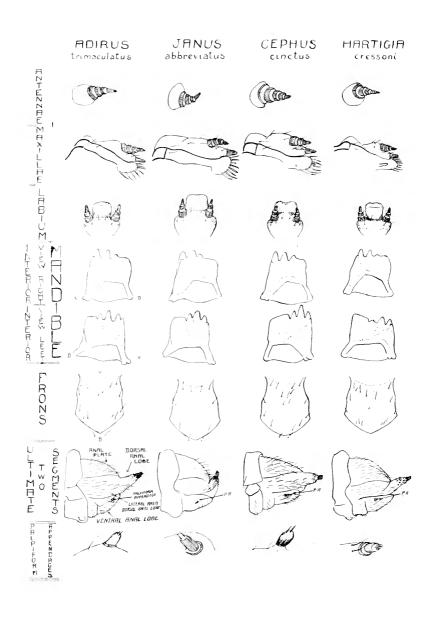
Abdomen.—Prolegs absent; terminating in a prong or horn, circular in cross section, short and arising from a spined, fleshy protuberance of the dorsal anal lobe; anal plate and ventral anal lobe haired; lateral area of dorsal anal lobe haired or bare, ventral anal lobe at posterior-lateral extremities with palpiform appendage appearing 2 jointed.

KEY TO LARVAE.

Ant	ntennae 4 jointed	Adirus trimaculatus (Say)
Ant	ntennae 5 jointed	
	Lateral area of dorsal anal lobe bare	
	$oldsymbol{J}$ anus abbrevi	atus Say and integer Norton
	Lateral area of dorsal anal lobe haired	
2.	Basal joint of antennae faint and incomple ventral anal lobe accompanied by a parest of the ornamentation of lobe; with tonized spots on venter of the 9th abd and plate entirely pale	ir of spines, separate from nout a pair of yellowish chi- lominal segment; anal lobes
	Basal joint antennae complete, distinct, anal lobe complete, no separation from appendages; venter of the 9th abdomina lowish chitonized spots; anal lobes and p	those approaching palpiform il segment with a pair of yel-

¹ S. A. Rohwer, Proc. Ent. Soc. Wash., Vol. XVII, No. 3, 1915, pp. 114-117.

Hartigia cressoni (Kirby)



Adirus trimaculatus (Say).

A somewhat pinkish-white, cylindrical larva with slightly enlarged thorax, 21 mm, long when nearly full grown.

Head.—Dorsad ventrad length 2 mm., breadth 1.66 mm., pale but with mandibles, their articulations, and labrum, chitonized and darkened; antennae 4 jointed.

Thorax.—With 3 pairs of small, mamma-like, unchitonized, fleshy, legs; faintly yellowish chitonized spots on pleura; prothorax similarly chitonized dorsally.

Abdomen.—Segment 3 annulate (or 4, counting the intersegmental skin); pleura prominent with a slight, possibly very faintly chitonized, longitudinally creased, swelling; prolegs absent with a pair of slight, pale, humps on the 8th abdominal segment and a similar slightly yellowish chitonized pair on the 9th; dorsal anal lobe, terminating in a prong; anal plate, ventral anal lobe and lateral area of dorsal anal lobe haired; lateral area of dorsal anal lobe yellowish with chiton, the ventral anal lobe with palpiform appendages and attended by several spines detached from the mass of that lobe's ornamentation.

This species is recorded boring in blackberry while the specimen described was received through Dr. F. H. Chittenden's office as coming from rose.

Janus abbreviatus Say.

A whitish cylindrical larva, 12 mm, long when nearly full grown and somewhat enlarged dorsally and laterally in thorax.

Head.—Dorsad ventrad length 1.75 mm., breadth 1.50 mm.; pale, but with mandibles, their articulations and labrum, chitonized and darkened; antennae 5 jointed.

Thorax.—With 3 pair of small unchitonized mamma-like, fleshy, legs; faintly yellowish chitonized spots on the pleura; prothorax similarly chitonized dorsally.

Abdomen.—Segments, distinctly 2 annulate laterally and with a small third annulet dorsally; pleura prominent; venter 3 annulate; prolegs absent; a pair of pale, rounded humps on the 8th abdominal segment and a pair of similarly placed but less elevated, yellowish, chitonized, spots on the 9th; dorsad anal lobe terminating in a prong; anal plate and ventral lobe somewhat haired; lateral area of dorsal anal lobe bare excepting 2 or 3 long prominent hairs and more yellowish than anal plate or ventral anal lobe; the ventral anal lobe with palipform appendages at the posterior lateral extremities.

¹ Connecticut State Geological and Natural History Survey Bulletin No. 22.

This species is recorded from Willow and Poplar and the following notes were obtained in my rearing it from the latter host.

The material was collected by Mr. Harry B. Weiss at New Brunswick, New Jersey, August 7, 1915. The larvae were boring down the twigs and were considerably beyond the killed portion. August 26, 1915 two adults Tetrastichus species emerged. September 7, 1915 some larvae in a fresh collection of infested twigs had lined a portion of their burrow then occupied with a thin glazed, transparent membrane. September 11, 1915 a single adult of Eurytoma species emerged. May 31, 1916 a female of Janus abbreviatus and a female of Microbracon species had emerged. Janus continued to emerge until June 17, 1916.

Janus integer Norton.

Agreeing with the description of Janus abbreviatus but found boring in the pith of Ribes species (current).

Material of this species was collected by Mr. Walter H. Snell at West Falmouth, Massachusetts, August 23, 1916 in *Ribes* species, sent to the Bureau of Entomology and placed in rearing. By September 18, 1916 three as yet undetermined Chalicids had emerged. *Janus* was at this time in the larval stage. On May 21, 1917 *Janus* began emerging and a single Proctotrypoid was found in cage.

Cephus cinctus Norton.

A whitish eylindrical larva, 11 mm. long when nearly full grown and somewhat enlarged dorsally and laterally in the thorax.

Head.—Dorsad ventrad length 1.5 mm., breadth 1.33 mm.; pale but with mandibles, their articulations and labrum chitonized and darkened; antennae 5 jointed.

Thorax.—Agreeing with description of that of Janus abbreviatus.

Abdomen.—Segments distinctly 3 annulate; the first annulation broad and sometimes faintly partially, sub-divided; pleura prominent; venter 3 annulate; prolegs absent; 8th abdominal segment with barely discernible white spots; 9th without the yellowish spots; dorsal anal lobe terminating in a prong; anal plate, lateral area of dorsal anal lobe and ventral anal lobe haired and white; ventral anal lobe with palpiform appendages at posterior lateral extremities and accompanied by several hairs quite separated from the rest of the lobe's ornamentation.

Material received from Cereal and Forage Crops Insects, Bureau of Entomology under Webster No. 8892 from *Elymus* canadensis.

¹ Connecticut State Geological and Natural History Survey Bulletin No. 22.

Hartigia cressoni (Kirby).

Whitish cylindrical larva, 22 mm. long when nearly full grown and somewhat enlarged dorsally and laterally in the thorax.

Head,—Dorsad ventrad length 1.87 mm., breadth 1.66 mm.; pale but with mandibles, their articulations and labrum chitonized and darkened; antennae 5 jointed.

Thorax.—With 3 pairs of medium size, fleshy, mamma-like, slightly chitonized, (especially the prothoracic) legs; pleura with chiton spots as has the pro- and meta thorax dorsally.

Abdomen.—Segments 3 annulate; pleura moderately prominent, yellowish, and glossy with chiton; prolegs absent; slightly chitonized circles on the 8th abdominal segment and larger more heavily chitonized spots on the 9th; dorsal anal lobe terminating in a prong; anal plate, lateral area of dorsal anal lobe and ventral anal lobe haired, chitonized (the plate, the least), and yellow; ventral anal lobe with palpiform appendages at the posterior lateral extremities and accompanied by hairs which are a part of that lobe's ornamentation and not separated from the rest.

Material collected by Essig from Rubus in California.

Actual date of publication September 23, 1918



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